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TITLE OF THESIS/*TITRE DE LA THÈSE* Effectiveness of Two Methods for Teaching Beginning Tennis

UNIVERSITY/*UNIVERSITÉ* University of Alberta

DEGREE FOR WHICH THESIS WAS PRESENTED/ *GRADE POUR LEQUEL CETTE THÈSE FUT PRÉSENTÉE* M. A

YEAR THIS DEGREE CONFERRED/*ANNÉE D'OBTENTION DE CE GRADE* Fall 1977

NAME OF SUPERVISOR/*NOM DU DIRECTEUR DE THÈSE* Dr. H J. McLachlin

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THE UNIVERSITY OF ALBERTA

EFFECTIVENESS OF TWO METHODS FOR TEACHING BEGINNING TENNIS

by

© SUSAN E. INGLIS

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE

OF MASTER OF ARTS

DEPARTMENT OF PHYSICAL EDUCATION

EDMONTON, ALBERTA

FALL, 1977

THE UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled Effectiveness of Two Methods for Teaching Beginning Tennis submitted by Susan E. Inglis in partial fulfilment of the requirements for the degree of Master of Arts in Physical Education.

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Date August 4 1977

Dedication

This thesis is dedicated to

my mom and dad.

Abstract

The purpose of this study was to investigate the effectiveness of an individualized self-instruction method and a traditional method for teaching beginning tennis. Subsidiary problems within this study were concerned with differences between the two methods over time related to physical skill performance, form during physical skill performance, knowledge gained and enjoyment.

Subjects for this study were twenty female university students who qualified as beginning tennis players. These subjects formed two groups of ten; they participated in seven, one hour tennis lessons over a four week period. In addition to the lessons, the groups met for a pre-test, post-test and a retention-test session. Tests administered during these testing sessions for data collection included a wall test, a serve test, subjective ratings of the wall and serve tests, and a knowledge test. Throughout the lessons comments were obtained from subjects as a measure of participant enjoyment of the lessons.

The data analysis utilized analysis of variance to compare means of the two groups on the wall test, serve test, and subjective rating scores, as well as Pearson-product correlations to determine the relationship between subjective ratings and physical performance on the wall test and the serve test. A Spearman-rank order correlation as well as percentage agreement were used to determine the

reliability of the three judges on the subjective rating evaluations. The odd-even Spearman-Brown correlation was used to determine the reliability of the knowledge test and a t-test was administered to test for significant differences between score means on the knowledge exam.

The results of this study indicated that the self-instruction method for teaching beginning tennis was as effective as the traditional method. Significant differences, in favor of the self-instruction method, were reported over the testing times on the wall test and the subjective serve ratings.

The results of the Pearson-product correlations showed a high relationship between the subjective ratings and the performance on the wall test. The relationship reported for the serve test and the subjective ratings was lower, thus indicating the need for further research for the development of a serve test that measures form and accuracy for beginning tennis. The reliability coefficient for the judges was high; making the subjective evaluation a useful instrument in measuring individual form during the performance tests. The knowledge test used in this study was found to be reliable as determined by the odd-even reliability correlation.

These findings add support for continued investigation into the development of effective teaching methods.

Acknowledgements

The author wishes to thank committee members Professor Larry Beauchamp and Professor Ruby Anderson for their contribution to this study. With sincere thanks the author acknowledges Dr. H.J. McLachlin, chairperson of the committee, who directed this study with encouragement, guidance and patience.

In addition, the author is indebted to three judges - Donna Harrison, Isabelle Bain and Candice B. Stasynec, for their valuable assistance. Thanks also go to the twenty-five study participants, and fellow graduate students Jim Sexsmith and Nancy Wood for their statistical expertise.

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Chapter I

Introduction

Tennis is a popular sport. The May 1977 issue of Newsletter - President's Council on Fitness and Sports quoted tennis as being "the most popular sport among adult Americans." This report was based on a survey of 4,616 persons taken from July/August, 1976 to February, 1977. The situation in Canada does not appear to differ. Recreation programs operate with waiting lists throughout the summer and community and school courts are used daily from early morning until late at night.

Expanded tennis programs and the resultant heavy use of the facilities have made physical educators even more aware of the need for improved programs and methods of instruction. The focus of a number of tennis studies, Bowles (1971), Cakans (1971), Leslie (1970), and Kneer et al (1977), has been to investigate methods which will encourage participants to adopt this lifetime sport (Armbruster et al, 1975, Mason, 1974). The adoption of the sport is encouraged for social enjoyment, self-expression or personal fitness throughout one's lifetime.

Improved program changes relate to the total physical education milieu. Cassidy et al (1974) stress the need to seriously change the methods of teaching which are used in physical education programs. These changes should be

focusing on the individual, his uniqueness of self, his needs and development. Physical education should be viewed as a holistic, mind and body process, developing and preparing the individual for the realities of the future.

Statement of the Problem

The purpose of this study was to investigate the effectiveness of two teaching methods. A traditional teaching method was employed and an individualized self-instruction method was designed for learning beginning tennis.

More specifically, this study was designed to answer the following questions:

1. Was the individualized self-instruction method as effective as the traditional teaching method used in this study?

2. Were the subjective ratings valid in measuring individual performance in the wall test and the serve test?

3. After a four week retention period, was there any difference in the individuals' performance levels on the wall and serve tests between the traditional and the individualized self-instruction groups?

4. Was the criterion-referenced knowledge test developed for this study a reliable instrument for measuring beginning tennis knowledge?

5. Was there any difference between the two groups with

respect to interest or enjoyment of the lessons?

Justification and Need for the Study

A review of the literature reveals a continuous search for various methods of instruction. Kneer et al (1977) reported a "plethora of research conducted to determine the effectiveness of individualized approaches versus the traditional teacher-directed group centered methods." They noted that research in this area of physical education appears to be limited. These individualized methods, based on programmed instruction techniques and motor learning theory, strive in the most effective manner to aid the individual through the learning process (Singer, 1975), and (Duane, 1973).

Singer and Dick (1974) in their book Teaching Physical Education A Systems Approach, presented an approach to teaching based on theory and practicality. The systems approach which they described:

1. requires a great amount of preparation time.
2. attempts to accommodate individual differences.
3. assesses student characteristics.
4. assesses the available resources, conditions and materials.
5. allows the media and instructional technology to shape the instructional strategies.

6. utilizes specific goal and behavioral objectives, with means of evaluation.
7. requires the teacher to analyze all aspects of the learning process in a more concrete fashion.
8. provides progress through a program to be confident and stable.

The use of such a system is logical, conceptual, and practical and is needed to plan and provide more effective programs for those in physical education.

Another area related to this study and supported by the literature is the utilization of an indoor gymnasium for teaching tennis. Perhaps the most significant support has come from the Joint Committee of the United States Lawn Tennis Association and the American Association of Health, Physical Education and Recreation, (1963). Other support has come from Marshall (1964), Hendrix (1962) and Jaeger and Leighton (1963).

One of the reasons frequently cited in the above writings for the utilization of a gymnasium was that it provides for better organization and control of classes. The use of an indoor facility (especially for research purposes) is advantageous since the scheduled class times and lesson content does not fluctuate with inclement weather. The use of instruction media such as films, and such teaching aids as chalk boards, targets, and wall surfaces for hitting are often more accessible in the gymnasium.

Limited facilities, either indoors, or out-of-doors has been an aspect of the search for effective methods for handling large classes. Programmed instruction studies Farrell (1970), Mariani (1970), and Neuman (1968) have attempted to individualize instruction which allows the student to work on his own, at his own pace through an already established program. This program operates with minimal direct control from the teacher. A recent study by Kneer et al (1977) investigated a facility cost analysis and an individualized program.

Kneer developed and tested a model which allowed for an increase in class size while satisfactory levels in the cognitive, psychomotor and affective learning domains were achieved. This model was based on an open-individualized instructor (OII) process. For the study, two groups, a traditional group and an OII group were compared. The OII method utilized a booklet through which students worked and were aided by film loops, pictures, books and consultation. The total process of the model incorporated the traditional group instruction (N=40) and the OII classes (N=100) meeting as a total group and as individual groups.

The results of Kneer, et al (1977) showed a significant improvement for both groups in the skills and knowledge test. The traditional group achieved a statistical significant increase in the levels of performance in the serve and the ground stroke testing. The results of the

knowledge test indicated no significant differences. The final results of the cost analysis indicated the OII program cost $11.58 per student to operate whereas the traditional program operated at $28.70 per student.

Definition of Terms

Traditional Method - This method of instruction is characterized by the teacher being the centre of the group and directing the class activities (Kneer et al, 1977). In this method, new material is presented with an explanation and demonstration, followed by time given to the students for practice. Within the traditional method, the teacher makes the decisions.

Self-Instruction Method - This method of instruction is based on programmed learning theory from which the individual works at his own pace.

In this study the instruction method utilized a booklet through which the students worked to learn the basics of beginning tennis.

Programming - "Is the process of arranging materials to be learned in a series of small steps designed to lead a student through self-instruction from what he knows to the unknown of new and more complex knowledge and

principles. The student responds at each step; when his response is correct he may proceed to the next one." (Lysaught, 1963, 2).

The self-instruction booklet developed for this study was based on programming theory.

Beginning Tennis Player - A person who has had no previous high school, university, recreational or professional instruction in tennis, and had not played more than five times in the past two years.

Wall Test - The test selected to measure the students' forehand and backhand stroke accuracy. This test is the one revised by Hewitt (1965) and is formally called "Hewitt's Revision of the Dyer Backboard Tennis Test." Throughout this study the test shall be referred to as the wall test.

Ground Strokes - The forehand and backhand strokes of tennis.

Limitations

The limitations of this study were:

1. Subject participation in other physical activities either prior to or during the study which may have had an

effect on tennis skill acquisition could not be controlled.

2. Subjects were requested not to play tennis during the four week retention period. Whether the subjects played tennis during this period could not be strictly controlled.

Delimitations

The delimitations of this study were:

1. The total study size was restricted to twenty-five female University of Alberta students who qualified as beginning tennis players.

2. The instruction time consisted of seven lessons each of one hour in length.

Chapter II

Review of the Related Literature and Research Hypothesis

This chapter begins with a discussion of tennis tests, tennis studies related to comparative methods of instruction, and specific tennis studies related to self-instruction methods. The latter part of the chapter focuses on self-instruction materials based on motor learning theory. The purpose of this chapter was to provide information related to the various components of the study and to provide support for the research hypotheses. The research hypotheses are included in the last section of the chapter.

Tennis Tests

Throughout the literature different researchers have used a variety of chosen or innovative tests to evaluate the performance of the beginning tennis player. These tests may be catagorized into three main areas, namely specific skills tests, written tests and subjective evaluations. This section will trace the development of these various evaluative tools which were utilized in this specific study.

Wall Test Development

The first test to measure general tennis ability of the

forehand and backhand strokes was designed by Dyer in 1932 and revised in 1938 (Dyer, 1938). This test involved a subject hitting a ball against a wall as many times as possible in three, thirty second trials. In order for the hit to be counted the ball had to land on or within the restraining lines. A five foot floor line was used as well as a three foot net line extending fifteen feet along the wall. Results of the tests done by Dyer showed the validity to be .92 when the Dyer test was compared to round-robin tournament rankings. The reliability ranged from .86 to .92 on the test re-test procedures.

Hewitt (1968) revised Dyer's test. He extended the restraining line to 20 feet from the wall. This extension reduced the use of unorthodox strokes caused by subjects standing too close to the wall. Hewitt's results showed a reliability coefficient for the test re-test method to be .82 for the ninety-one college players used in his study. Validity was determined to be from .68 to .73 for the beginning classes when the test results were compared to round-robin tournament results.

Although various other tests have been devised (Hewitt, 1966), (Kemp et al 1968) and (Broer, et al 1950) it is the Hewitt revision of the Dyer tennis test which is most widely accepted and used by physical educators. This test was used in the present study as a measure of forehand and backhand stroke ability.

Serve Test

The development of a serve test to measure the skill level of beginning tennis players has been slower than that for the ground strokes. The problem exists that for a serve test, speed and accuracy, must both be considered (Haugen, 1970).

Tests such as Cobane's (1962) and Hewitt's (1966) attempt to measure accuracy as well as speed. These tests involve on the court serving with the distance of the second bounce the important factor in determining serve ability. More points are awarded for bounces that are further back from the serve court.

The foregoing tests do not however take into account the form used in serve execution. Neuman (1967) discussed the importance of form for stroke mastery at the intermediate and advanced levels of tennis. Form is of prime importance in the early stages of skill development. The Canadian Lawn Tennis Association Coaches Manual (1976), advocates form and control with accuracy followed by a natural speed increase for the serve. Paulkner (1970) and Johnson et al (1976) in their books stress control and accuracy as an initial emphasis in teaching beginners.

The serve test utilized in this study was devised by the researcher. The test was made as specific to the game as possible with subjects serving two, four point trials.

Students were marked on accuracy as well as form as indicated by the subjective ratings given by the judges.

Subjective Ratings

Few studies in the past have utilized a subjective rating in evaluating beginning tennis ability.

The scale devised by Neuman (1968) rated individuals on accuracy and control, stroking form, and footwork for the forehand, backhand and serve strokes. An adaptation of the criteria used by Neuman was used in the present investigation. In Marshall's (1964) rating scale the numbers one to five were accompanied by the words very poor, poor, average, good and excellent respectively. These words were included in the present study to add clarity in determining rating scores.

A subjective rating was used in this study to measure the individual stroke form as well as to correlate the objective test results to the subjective results to determine the relatedness.

Knowledge Test

Throughout the literature there are numerous tennis knowledge tests. Many books such as Johnson (1976), Murphy (1976), and Barnaby (1975) concerned with teaching tennis include questions which the teacher can use in testing their

tennis students.

Specific studies, for example Hewitt (1937, 1964), Scott (1941), Broer et al (1950) and Miller (1953) have been done to develop tests that are valid. These studies have developed tests which are suited to various levels of play and include various strokes and strategies.

The majority of tennis tests reported in the literature are norm-referenced tests (Singer, 1974). That is, they are devised to produce a range of scores. A norm-referenced type of test is group-oriented and attempts to indicate an individual's performance in relation to the other class members.

For this study, a criterion-referenced test was devised (Singer, 1974). That is, a test which specifically tested the instructional objectives. The results of such a test indicated exactly what the student had achieved from the course material. For this study a student's mark indicated where the student was weak or if many students did poorly it could have indicated a weak section of the lesson material.

The use of a criterion-referenced exam would seem more practical in a situation where the amount of information retained and understood by the individual is of prime importance. For this study the criterion-referenced exam was a measure of which method presentation resulted in greater knowledge attainment.

Tennis Studies Related to Comparative Methods of Instruction

A review of the available literature concerning comparative tennis studies indicated a variety of topics with little concern for developmental research of a specific area.

The most popular topic has been the comparison of various racket lengths. Tatje (1966), Bouton (1966), Leslie (1970) and Bowles (1971) have all reported studies in this area.

Tatje (1966) reported that, for her group of beginning female freshman tennis students, the short-handled racket facilitated serving skill, but did not aid in ground stroke performance. Although short rackets initially seemed to facilitate performance, it was when the transfer from a short handle to a longer handle was made, performance was impaired.

In her comparison of two progressions for teaching beginning tennis, Bouton (1966) concluded that the two methods of instruction, the tradition and the racket progression (from hand to wooden paddle to short racket to regulation racket) were equally effective.

Leslie (1970) compared high school females in beginning tennis skills using two methods. One group was taught using the traditional racket length and the other group used a choked racket. The Broer-Miller Forehand-Backhand Test and

the Dyer Backboard Test were administered. A measure for grip strength was determined by using a hand dynamometer. Results showed both groups learned equally effectively, with no grip strength improvements.

Other areas of investigation are represented in the following.

A skilled instructor was compared to an unskilled instructor in Cakans' (1971) study. The results of the Hewitt Forehand and Serve Tests indicated significant improvements for the group which had received experienced instruction and a significant change in the negative direction for the inexperienced instruction group on the Hewitt Forehand Test. For the inexperienced instruction group no significant change was reported on the Hewitt Serve Test.

The use of teaching aids was included in Solley and Borders' (1965) research. They investigated the effectiveness of the use of the Ball-Boy machine in teaching the forehand drive. Results showed that when the Ball-Boy machine was used after a traditional method instruction period a significant improvement, as measured by a revision of the Broer-Miller Test, was achieved.

O'Donnell (1956) studied material presentation of whole, progressive part and pure part methods for teaching beginning tennis. No significant differences were reported

in one method over another for the backhand and the serve, however, for the forehand stroke the whole method proved to be best.

Cragin (1965) compared a traditional teaching method to a method utilizing drills to offer students the opportunity to repeat the basic skills of the game. Although the use of drills in teaching has been supported in the literature, the results of this study indicated no significant difference between the two groups.

Specific Tennis Studies Related to Self-Instruction Methods

It is apparent that a variety of tennis comparative studies have been researched in the past twenty years but few directly relate to the present investigation. In addition to the study by Kneer et al (1977) reviewed in Chapter I, three other studies relating specifically to tennis were reviewed.

Farrell (1970) designed a study to compare a programmed method to a teacher - directed method for teaching beginning tennis skills.

Four groups of women, two programmed and two traditional teacher-directed groups, received seven - fifty minute sessions on the forehand and backhand strokes.

The material for the programmed group consisted of twenty tasks with directions, diagrams, practice methods,

and check lists to be followed for the achievement of the behavioral goals.

The Broer-Miller Forehand-Backhand Drive Test and the Wallboard Test were administered prior to the classes and during the post-test session.

The results of Farrell's study led to the conclusions supporting programmed instruction methods for beginning forehand and backhand strokes. Farrell's study also indicated that different skill levels within beginning tennis classes benefit from various instructional methods.

Mariani (1970) compared a traditional command method to a task method of teaching beginning tennis skills. The two groups of thirty male college students were given a pre-test, a post-test after twelve, fifty minute periods of instruction (two periods each week for six weeks) and a retention-test after a sixty day retention period. The Broer-Miller test was used to measure forehand and backhand skill achievement.

The command method of teaching used in Mariani's study was characterized by the traditional method of teaching in which a command-response interaction between the instructor and the students exists. Also related to the command method was the row formation of students with the teacher directing the students through the initial material presentation followed by practice time, an evaluation, a question-answer

period, and a brief outline of the next days lesson plan.

The task method was characterized by the student being more involved in the decision making process. After an initial explanation and demonstration by the instructor, the students were issued task cards which provided them with standards of performance for tasks of varying difficulty. The student was free to choose at what level to begin and the amount of practice necessary.

The post-test results of this study show the task method to be superior to the command method in the teaching of the backhand stroke. For the teaching of the forehand stroke there was no significant difference between the groups. The results of the retention-test show the task method to be more effective in both the forehand and the backhand strokes.

Newman (1968) investigated the effectiveness of a traditional method and a programmed method on achievement of beginning tennis skills.

Two groups of twenty male university students enrolled in tennis classes were given fourteen periods of instruction. Group homogeneity was determined by group mean comparisons on height, weight, the Hewitt revision of the Dyer backboard tennis test (wall test) scores, and the American College test scores. Tests used to measure performance after the instruction period of seven weeks

included the wall test, a single-elimination tournament, and subject rating of performance in the tournament.

The results of the 't' tests used to test for significant differences within the groups over time, and between the groups over time, indicated no significant difference between the two teaching methods in general skill ability levels. However, while the group taught by the traditional method did improve significantly in general tennis skills, the programmed group received better subjective rating scores than the traditional group.

The booklet developed by Neuman was based on Mosston (1966) and Poshay's (1964) guidelines for the development of program planning. This booklet guided the individual through material covering ball control, the ground strokes, the serve, and footwork.

As outlined by Newman, the booklet included a sequence of small steps with a logical progression from simple to complex. Each step of the booklet required a subject response, thus directing the student closer to completion of the desired behavioral responses.

Neuman recommended further study to include varying lengths of program instruction.

Self-Instruction Materials Based on Motor Learning Theory

The area of motor learning, within Physical Education,

offers theoretical input for the development of effective physical education programs. Neuman (1968) reviewed the development of learning theory as preliminary support to his investigation of programmed instruction. Andrews (1976) in his opening address at the International Congress of Psycho-Motor Learning, November 1976, pointed out the difficulty, but the need for, relating laboratory experimental findings in motor learning to the practical teaching environment.

Many books and articles, for example Lawther (1968), Robb (1972), Murphy (1962), Singer (1975) and Thompson (1976) provide evidence of the increase in writings to bridge the gap between the laboratory and the field of learning in Physical Education. Lawther (1968) pointed out the necessity of understanding basic motor learning theory when working with methods of teaching physical activity. Singer (1975) in his textbook Motor Learning and Human Performance concerns himself with the relevant application of learning theory to the teaching environment.

The following section will draw from the writings of Deterline (1962), Lysaught (1963), Green (1962), Robb (1972), Duane (1973), and Keller (1974) in the discussion of characteristics of self-instruction programmed materials and construction of these materials.

Introduction to Self-Instruction Materials

The development of self-instruction methods, based on

programmed learning, can be described as "an appropriate set of learning materials which are organized to help a learner achieve specified objectives..." (Duane, 1973, 169). Within a self-instruction program the learner progresses through the units of material, achieving the behavioral expectations of each sub-unit before continuing.

A self-instruction method is in no way an attempt to replace the teacher, rather, the objective is to provide for the teacher, basis of material, method and organization from which they may proceed. (Green, 1962)

Keller (1974) described the instructor as "the manager of learning" in an individualized structured learning environment. The instructor becomes a member of the system, preparing, monitoring, altering and providing feedback within the program.

Green (1962) outlined the benefits of self-instruction booklets. This method of instruction frees the instructor from actual teaching thus enabling the teacher to pursue greater levels of teaching as well as when necessary approximate a student - tutor relationship. A student - tutor relationship allows for interaction between the pupil and the teacher; the teacher can spend time helping the student. A self-instruction method may also encourage students to pursue independent research. For absentees the program allows the student to 'catch up' without slowing the rest of the class.

Green also emphasized the development of sharper discrimination because of the stimulus - response - reinforcement contingency. Sharper discrimination powers and an expanded behavioral repertoire (which results in programmed learning) prepares the individual to "more adequately deal with their environment." (Green, 1962, 202)

Characteristics of Self-Instruction Materials

A further description of self-instruction materials can be presented by outlining the characteristics of these programs.

For the student the program individualizes the learner's experience, enhances his readiness and alertness by providing the student with an active role, and maintains a level of motivation through constant reinforcement. (Lysaught, 1963) The unique feature of the self-instruction method is that it allows the student to work at his own learning pace. (Green 1962)

The characteristics of the program involve program goals and objectives set prior to the beginning of the program, material presented in an organized logical sequence, each unit of material requiring the student to make an overt response, mastery of each unit before the student continues to the next, and immediate feedback to indicate to the student the adequacy of the response. (Green, 1962, Lysaught, 1963) The feedback given to the

student is what Robb (1972, xii) viewed as the "heart of skill-learning."

Preparing and Operating the Self-Instruction Program

Green (1962) noted that there is no one way to develop a program. Writing a program is like writing a book, everyone writes differently. However, there are some techniques or guidelines to follow once the type of program has been chosen.

Lysaught (1963) identified three key factors to consider in preparing materials. A knowledge of writing skills, and an understanding of the material and the learning process are important. Any program should be prepared with short and long range objectives in mind. If possible the teacher should be the person to set the program, in any case the teacher and the program developer must be familiar with the material to be presented. (Green, 1962) The material to be included in such a program should be considered in terms of detail and amount of material, the length and time of the program and the relationship of the program to the teaching environment.

Green (1962) outlined program guidelines. The behaviors expected by the students should be clearly outlined, and ambiguous material should not be included. The initial steps of a program should deal with the known rather than the unknown, with the units or segments of instruction small

enough for the students to handle. Within a new progression of material a good amount of new material, built on old material should be presented. Feedback, as to the student's progress should be immediate and help should be given by the instructor to the student when needed.

The self-instruction booklet developed for this study attempted to incorporate the foregoing guidelines and considerations.

Research Hypothesis

The purpose of this study was to compare the effectiveness of two methods of teaching beginning tennis.

The research hypothesis of this study was that the self-instructional method designed was as effective as the traditional method for teaching beginning tennis.

Subsidiary hypotheses were as follows:

1. The self-instruction method designed for this study was as effective as the traditional method for participant skill acquisition on the wall test.
2. For the wall test, over time, the self-instructional method was as effective as the traditional method.
3. The self-instruction method designed for this study was as effective as the traditional method for knowledge development as measured during the post-test session.
4. The self-instruction method designed for this study

was as effective as the traditional method for participant skill acquisition on the serve test.

5. For the serve test, over time, the self-instruction method was as effective as the traditional method.

6. The self-instruction method designed for this study was as effective as the traditional method for subjective ratings of participant performances on the wall test.

7. For the subjective ratings on the wall test, over time, the self-instruction method was as effective as the traditional method.

8. The self-instruction method designed for this study was as effective as the traditional method for subjective ratings of participant performance on the serve test.

9. For the subjective ratings on the serve test, over time, the self-instruction method was as effective as the traditional method.

Chapter III

Methods and Procedures

Introduction

This study investigated the effectiveness of two teaching methods in learning beginning tennis. In the development of the methods and procedures two major considerations were of importance.

First, each phase of the initial planning was designed to be as near as possible to an actual teaching-learning environment. Second, given that the first consideration was met, attention was paid to keep the classes and testing procedures as standardized and as close to the planned process as possible.

Subject Recruitment

The subjects for this study were female university students (age range from 18 to 27 years). Subjects were recruited from the women's intramural program, by posters placed in the women's locker room of the Physical Education and Recreation Centre, by requests inserted in the campus student newspaper, The Gateway, and by personal contact. In order for subjects to qualify for this study they had to meet the following criterion. This criterion was a modified version of that used by Neuman (1968).

1. Had never received previous tennis instruction at the

high school, university or recreation level.

2. Had not played more than five times in the past two years.

3. Would be available to attend all sessions, including the date set for the retention-test.

Class Allocation

As the subjects registered for the lessons they selected one of the class times based on personal time committments and convenience. Subjects were not aware of which class would be taught by one of the two teaching methods used in this study.

Class Procedures

The two classes (ten subjects in each class) met twice a week over a four week period for seven, one hour lessons. Classes were held in a gymnasium. The use of a gymnasium for tennis instruction was supported by Hendrix (1962).

In addition to the lessons, both groups met for a pre-test, post-test, and retention-test session. The following, outlines the content of the testing sessions.

Pre-test Session	- Wall test
Post-test Session	- Wall test
	- Serve test
	- Written test
	- Subjective rating

Retention-test Session - Wall test
- Serve test
- Subjective rating

Instructional Materials

The two classes had the same instructor. The teaching material was the same for both classes but the method of presentation differed.

The material presented in booklet form to the self-instruction group is found in Appendix B. The class outline for the traditional group is found in Appendix C. Procedures for the initial pre-test sessions are the same for both groups and are found in Appendix C.

For both classes the following instructional aids were used:

1. A chalk board to record the date, class reminders and a brief outline of daily class material for the traditional group.

2. A large laminated court diagram to aid in the teaching and understanding of court areas and markings.

3. Film loops (8mm) depicting specific tennis strokes and game material.

Equipment

Twenty tennis rackets ranging from light to medium

weight with grip sizes of 4 3/8 inches to 4 5/8 inches were used. Forty-five white colored Slazenger tennis balls were used.

A volleyball net was used in place of a regulation tennis net.

The film loops and 8mm film loop projector were obtained from the Education library and the Audio-Visual Aid Centre.

Subject Information Concerning the Study

The subjects were informed prior to and during the lessons that they were participants in a research study.

Participants were told that various exercises or tests were being conducted before the lessons, immediately after the lessons and after a four week retention period in an attempt to measure the effectiveness of the two teaching methods.

Tests Used in the Study

To measure the effectiveness of the two methods of instruction, tests were chosen which would measure various behavioral changes. The wall test used was Hewitt's Revision of the Dyer Backboard Tennis Test, Hewitt (1965) as described in Chapter II. The serve test and the knowledge test were devised by the researcher and approved by the

members of the thesis committee. The subjective rating measure was a modification of the subjective ratings reported by Marshall (1964) and Newman (1968).

The wall test and the serve test were utilized to measure physical skill ability. The written test was used to measure tennis knowledge. The subjective rating system was utilized to measure participants form in skill execution. Continual feedback in the form of 'comments' was maintained as a measure of participant interest and enjoyment of the instruction. (Appendix E)

Wall Test

The wall test was administered in the first session (pre-test), the eighth session (post-test), and after the four week retention period (retention-test).

During the pre-test session a brief description of the ground strokes (forehand and backhand) was given to familiarize the students with the type of strokes used in the wall exercise. A demonstration was presented to show the class the test execution. A question - answer period was followed by further verbalization for clarification.

A similar procedure for the post-test session was followed.

For the retention-test session the test explanation was on typed cards. (Appendix D)

Test administration for the wall test was as follows:

1. Each student was given a two to three minute warm-up in the practice area. As one person was performing the test, the next person to be tested was warming up.

2. Students began the test from behind the twenty foot restraining line with two balls in hand.

3. On the signal "when you are ready, you may begin" the student put the ball into play by dropping and hitting the ball with a ground stroke.

4. The stop watch was not started until the first successful hit was made.

5. After 30 seconds the signal "stop" was given. The number of successful hits was recorded on the student's record sheet (see Appendix D) and the test was administered for two more trials making the wall test score the total number of successful hits in three, thirty second trials.

Serve Test

The serve test was administered during the eighth session (post-test), and during the retention-test session.

During the post-test session, before the test began, a verbal description of the test was given. For the retention-test the instructions for the test were typed and distributed for the subjects to read. (Appendix D)

Test administration for the serve test was as follows:

1. One person progressed through the serve test while the others waited quietly at the back of court or retrieved tennis balls.

2. The person being tested assumed the correct stance for the serve, and stood behind the baseline to the right of the centre mark with two balls in hand.

3. On the signal "you may begin" she served two, four point trials alternating from right to left side of the centre mark.

4. When the points were served the score was recorded on the individual's record sheet. (Appendix D).

Subjective Rating

A panel of three judges rated the individuals on their form in performing the ground strokes during the wall test and on the serve during the serve test.

These judges were carefully selected and had the

following characteristics. Judge #1 was a tennis player with tournament experience, an instructor of beginning tennis, and a Graduate Student in Physical Education. Judge #2 was an experienced tennis player with instructing experience and had completed the Canadian Lawn Tennis Association Coaches Level I and II course. Judge #3 was an experienced intercollegiate tournament player who was familiar with the fundamentals of beginning tennis. Judge #3 was also a Graduate Student in Physical Education.

Prior to the testing sessions the judges met, reviewed the judge's score sheet (Appendix D), and went through practice trials.

For the wall test the judges were situated ten feet back from the side line of the wall test hitting area. The judges were seated on a bench at some distance from one another in order to ensure independent ratings (scores).

For the serve test the judges were located five feet back from the side line on the receiving side of the court. As with the wall test the judges were separated from one another.

As the students were engaged in the tests the judges independently rated the forehand, backhand and serve and recorded the scores on the rating sheets.

Variables

In this study there were two types of variables: experimental and non-experimental.

Experimental Variables

The experimental variables were subdivided into the dependent and independent variables.

The dependent variable in this study included the students ability to execute the forehand, backhand and serve strokes, complete a written exam and demonstrate tennis form before a panel of three judges.

The independent variables in this study were the two methods of instruction selected to teach the beginning tennis classes.

Non-Experimental Variables

The non-experimental variables in this study were individual physical differences, personal activity level differences and psychological (including motivation and interest) level differences.

The control of these non-experimental variables was maintained where possible by: the process for subject selection, structure of the classes, and the standardization of testing and class procedures.

Reliability and Validity of the Wall Test and the Serve Test

Hewitt (1968) reported coefficients of .68 to .73 for validity and .82 for reliability for his wall test. From these findings we may assume that the wall test, formally called 'Hewitt's Revision of the Dyer Backboard Tennis Test', is a valid and reliable instrument for measuring beginning tennis ground stroke ability.

The development of a valid serve test was a subsidiary problem of this study. Face validity, according to Eckert (1974, 135), refers to "the logic of the measurement of physical performance per se." The execution of the serve test was designed to be as specific to a game situation as possible while still under standardized testing procedures. The reliability of the serve test was determined by the subjective rating and skill test correlations.

Statistical Analysis

The data were analyzed using a two way analysis of variance fixed effects model for equal cell size and a Pearson-product moment correlation. These analyses (Anov 25 and Dest 02) were carried out through the use of the Division of Educational Research Services (DERS) programs at the University of Alberta

A Spearman-rank order correlation was used to determine the reliability of the judges on the subjective rating

evaluation. The formula for the Spearman-rank order correlation was:

$$\rho = 1 - \frac{6\Sigma D^2}{N(N^2 - 1)}$$

Ferguson (1971)

The percentage agreement among the judges was also determined for the ratings given during the post-test and retention-test for the wall and serve test.

The reliability of the knowledge test was determined by using the odd-even Spearman-Brown reliability correlation. The formula used to compute this correlation was:

$$r_{xx} = \frac{2r_{hh}}{1 + r_{hh}}$$

Ferguson (1971)

To test for significant differences between score means on the written knowledge exam a t-test was used. The formula for this computation was:

$$t = \frac{m_1 - m_2}{\sqrt{\frac{(N_1-1)\sigma_1^2 + (N_2-1)\sigma_2^1}{N_1+N_2-2}\left(\frac{N_1+N_2}{N_1N_2}\right)}}$$

Eckert (1974)

A Tukey test was used to determine which means for the wall test were significantly different from each other. The formula used for this computation was:

$$S_{\bar{x}} = \sqrt{S_w 2/N}$$

Ferguson (1971)

Statistical Hypotheses

For each of the research hypotheses as stated in chapter II the following null and alternative hypotheses were tested.

Research hypothesis 1.

Null: $H_0 : M(1) = M(2)$

Alternative: $H_1 : M(1) \neq M(2)$

Research hypothesis 2.

Null: $H_0 : M(1) = M(2)$

Alternative: $H_1 : M(1) \neq M(2)$

Research hypothesis 3.

Null: $H_0 : M(1) = M(2)$

Alternative: $H_1 : M(1) \neq M(2)$

Research hypothesis 4.

Null: $H_0 : M(1) = M(2)$

Alternative: $H_1 : M(1) \neq M(2)$

Research hypothesis 5.

Null: $H_0 : M(1) = M(2)$

Alternative: $H_1 : M(1) \neq M(2)$

Research hypothesis 6.

Null: $H_0 : M(1) = M(2)$

Alternative: $H_1 : M(1) \neq M(2)$

Research hypothesis 7.

Null: $H_0 : M(1) = M(2)$

Alternative: $H_1 : M(1) \neq M(2)$

Research hypothesis 8.

Null: $H_0 : M(1) = M(2)$

Alternative: $H_1 : M(1) \neq M(2)$

Research hypothesis 9.

Null: $H_0 : M(1) = M(2)$

Alternative: $H_1 : M(1) \neq M(2)$

Chapter IV

Results and Discussion

Various tests to measure the effectiveness of the two instructional methods were employed in this study. This chapter includes results of the tests with interpretations and discussion.

Reliability of Knowledge Test

The odd-even reliability correlation of the knowledge test was determined to be 0.71. For 18 degrees of freedom this correlation was significant at the .01 level of confidence. Therefore, it may be assumed that the knowledge test administered in this study, was considered to have a high level of reliability.

Mean Results of Knowledge Test

The t-test used to test for a significant difference between means of the raw scores on the knowledge test yielded a result of 1.385. For 18 degrees of freedom at the .05 level of confidence this score of 1.385 indicated no significant difference between means.

This result shows that although the self-instruction method scored higher than the traditional method the difference was not statistically significant. Therefore, the null hypothesis for research hypothesis 3 - the self-

instruction method designed for this study was as effective as the traditional method for knowledge development - was accepted.

Reliability of Subjective Ratings

The reliability of the three judges in their subjective ratings as determined by the Spearman-rank order correlations were:

Judge #1 - Judge #2	.749
Judge #1 - Judge #3	.748
Judge #2 - Judge #3	.742

These correlations indicate a relatively high reliability between judges in their subjective ratings. This would indicate that the judges were ranking the individuals in the same order; however, not necessarily giving each subject the same rating on the scale.

Percentage Agreement of Judges

The percentage agreement of the judges in rating the individuals on the performance tests was reported in Table 1.

Table 1

Percentage Agreement of Judges on the Subjective Ratings

Post-test	Percentage Agreement
Wall Test	71.62%
Serve Test	78.30%
Retention-test	
Wall test	56.62%
Serve test	79.96%

The results of Table 1 revealed that for the subjective rating the three judges were consistent in awarding an individual the same score.

Analysis of Variance Results

The results of the analysis of variance for the three measures (wall test, serve test, and subjective ratings) were reported according to the following sample table 2.

Sample Table 2 - Analysis of Variance Results

Dependent Variable

		Groups A	Groups B	
Time	Post	mean	mean	F ratio for time _____.
	Retention	mean	mean	
		F ratio for groups _____.		Interaction F ratio for group by time _____.

* significant at .05 level
** significant at .01 level

Groups A = traditional method

B = self-instruction method

Table 3

Analysis of Variance - Wall Test Means

	Groups A	Groups B	
Time: Pre	7.329	6.364	
Time: Post	8.931	8.697	F ratio for time 9.933**
Time: Retention	8.563	9.397	
	F ratio for groups 0.015.		Interaction F ratio for group by time 1.444.

* significant at .05 level
** significant at .01 level

The results reported in Table 3 indicate that for the wall test there was no significant difference between the traditional group and the self-instruction group. Therefore, the null hypothesis for research hypothesis 1 - the self-instruction method designed for this study was as effective as the traditional method for participant skill acquisition on the wall test - was accepted.

However, over time there was a significant difference. A Tukey test procedure was used to determine which means were significantly different from each other at which testing time (pre, post, or retention). The results of the Tukey test as shown in Table 4 indicated that the difference in means was between the pre-test and the retention-test for the self-instruction group. Therefore the alternative

hypothesis for research hypothesis 2 which stated - for the wall test, over time, the self-instruction method would not be equal to the traditional method - was accepted.

Both groups, according to Table 3, reported improved performance in the wall test between the pre-test and the post-test. The traditional group's performance decreased slightly on the retention-test but was still improved over the pre-test. For the self-instructional group the retention-test showed a further increase in performance on the wall test.

Figure 1 represents the wall test mean results.

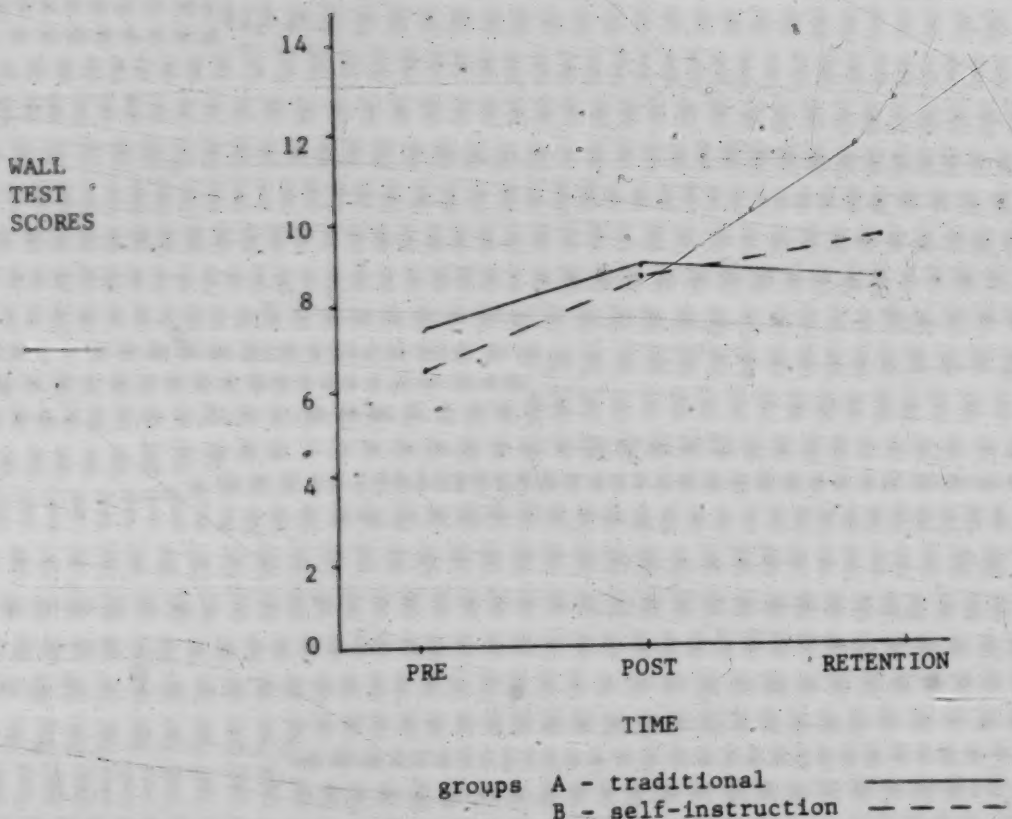

Figure 1

Wall Test Mean Results

Table 4

Differences Between Wall Test Means

		Pre 7.329	Post 8.931	Retention 8.563
Group A	Pre	---	1.602	1.234
	Post		---	0.368
	Retention			---

		Pre 6.364	Post 8.697	Retention 9.397
Group B	Pre	---	2.333	3.033*
	Post		---	0.700
	Retention			---

Groups A = traditional

B = self-instruction

*significant at .05 level

Table 5

Analysis of Variance

Serve Test Means

		Groups A	Groups B	
Time	Post	1.800	2.200	
	Retention	2.100	2.750	F ratio for time 3.753.
		F ratio for groups 2.106.		Interaction F ratio for group by time 0.325.

* significant at .05 level
** significant at .01 level

The results reported in Table 5 show no significant difference between the traditional group and the self-instructional group for serve skill acquisition. The null hypothesis for research hypothesis 4 - the self-instruction method designed for this study was as effective as the traditional method for participant skill acquisition on the serve test - was accepted.

Both groups, according to Table 5, improved performance in the serve test between the post-test and the retention-test. This improved performance showed no statistical difference, therefore, the null hypothesis for research hypothesis 5 - for the serve test, over time, the self-instruction method was as effective as the traditional method - was accepted.

Figure 2 represents the serve test mean results.

Table 6

Analysis of Variance

Subjective Rating Wall Test Means

		Groups A	Groups B	
Time	Post	5.863	5.363	F ratio for time 1.469.
	Retention	5.964	5.729	
		F ratio for groups 0.713.		Interaction F ratio for group by time 0.471.

* significant at .05 level
** significant at .01 level

The subjective rating wall test results as shown in Table 6 indicate no significant difference between the two groups. Both the traditional group and the self-instruction group received higher subjective ratings for the retention-test over the post-test. Given the results of this measure the null hypothesis for research hypothesis 6 - the self-instruction method designed for this study was as effective as the traditional method for subjective ratings of participant performance on the wall test - and null hypothesis for research hypothesis 7 - for the subjective ratings on the wall test, over time, the self-instruction method was as effective as the traditional method - were accepted.

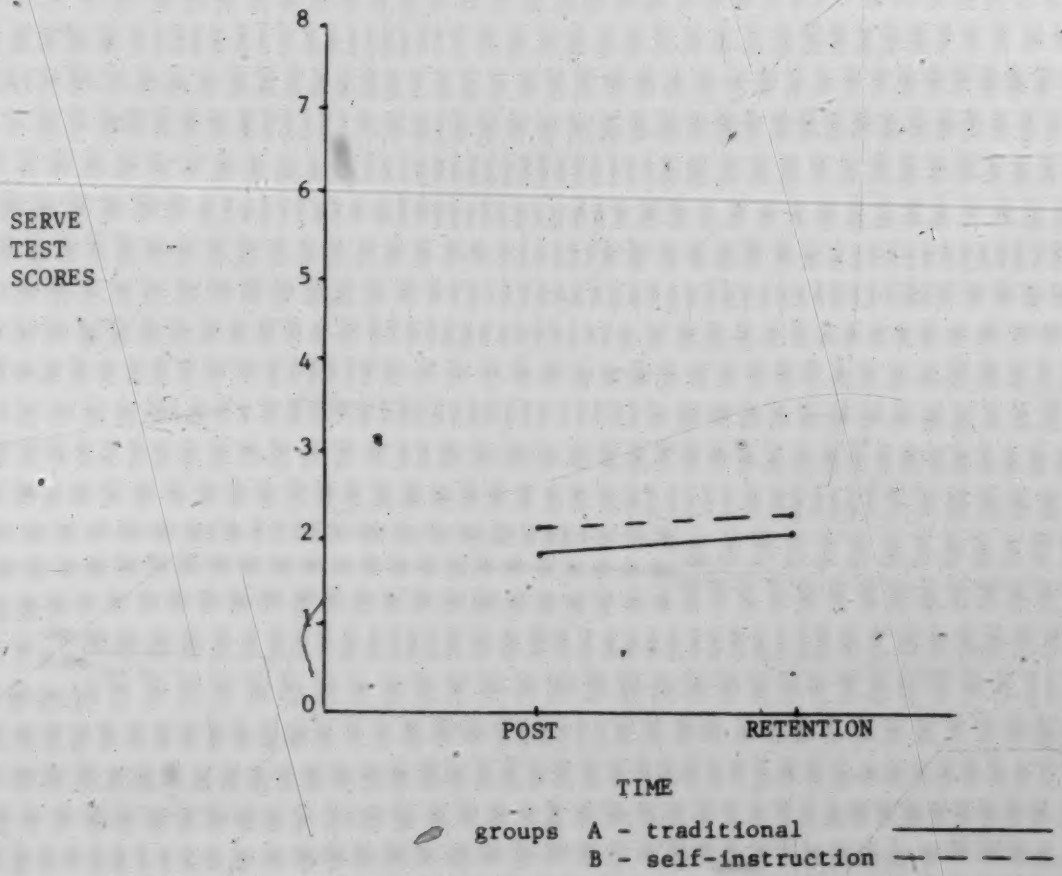

Figure 2

Serve Test Mean Results

Figure 3 represents the subjective rating wall test results.

Table 7

Analysis of Variance

Subjective Rating Serve Test Means

	Groups A	Groups B	
Time: Post	2.630	2.798	
Time: Retention	3.063	3.197	F ratio for time 13.491.**
	F ratio for groups 0.390.		Interaction F ratio for group by time 0.024.

* significant at .05 level
** significant at .01 level

The results for the subjective ratings on the serve test as shown in Table 7 indicate no significant difference between the two groups. Therefore, the null hypothesis for research hypothesis 8 - the self-instruction method designed for this study was as effective as the traditional method for subjective ratings of participant performance on the serve test - was accepted. However, a significant difference at the .01 level of confidence was reported over the time factor. Both groups showed an increase in serving form from the post-test to the retention-test. It appears that the significant difference was an increase between the post-test and the retention-test for both groups. The alternative

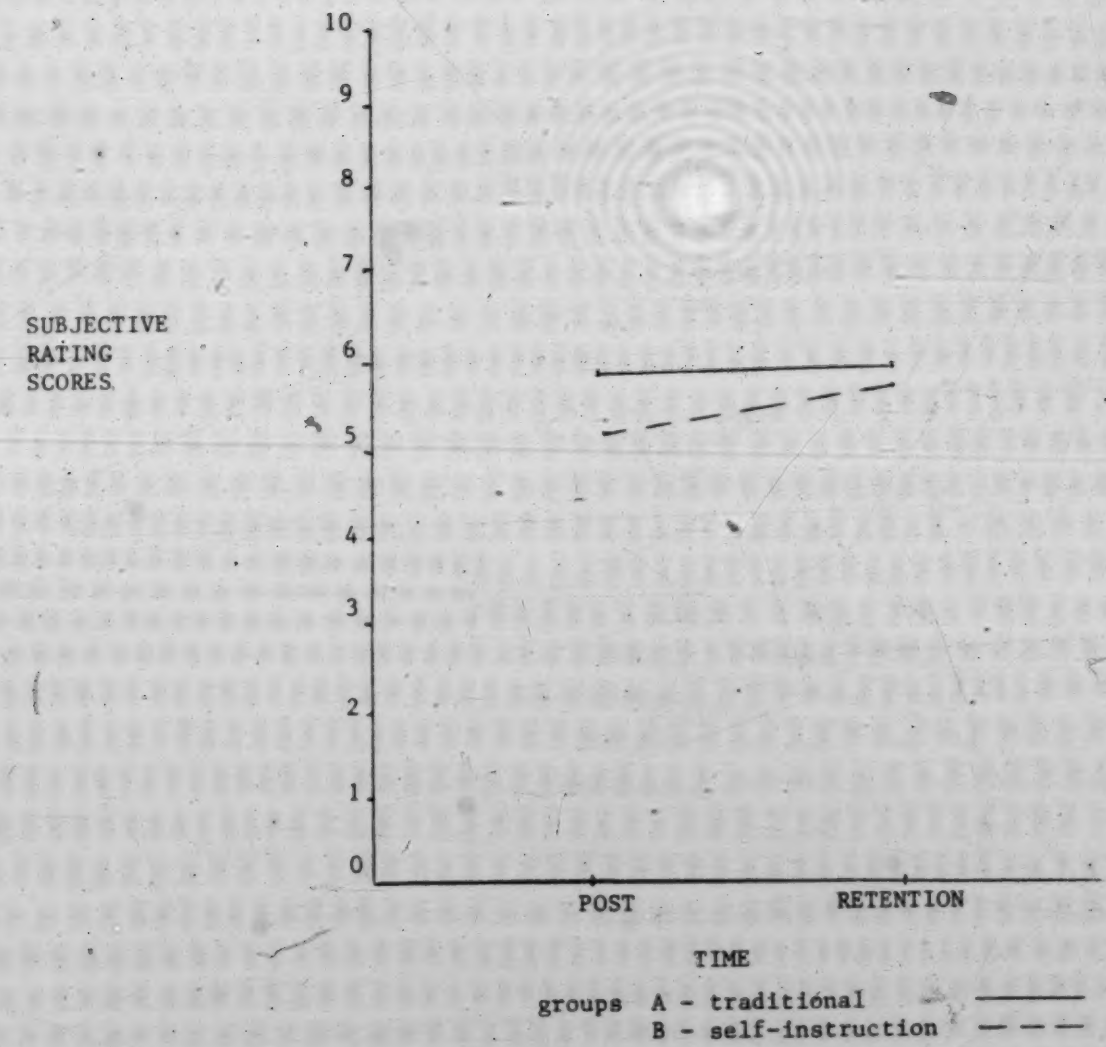

Figure 3

Wall Test Subjective Rating Results

hypothesis for research hypothesis 9 - for the subjective ratings on the serve test, over time, the self-instruction method was not equal to the traditional method - was accepted.

Figure 4 represents the subjective rating serve test results.

Correlation Results

The results of the Pearson-product correlations were as follows.

The correlation of the wall test to the subjective rating of the wall test during the post-test was 0.706, $p < 0.001$.

The correlation of the wall test to the subjective rating of the wall test during the retention-test was 0.629, $p < 0.003$.

The correlaion of the serve test to the subjective rating of the serve test during the post-test was 0.481, $p < 0.032$.

The correlation of the serve test to the subjective rating of the serve test during the retention-test was 0.471, $p < 0.036$.

The low positive correlations recorded for the serve test and the subjective serve ratings were due to the serve

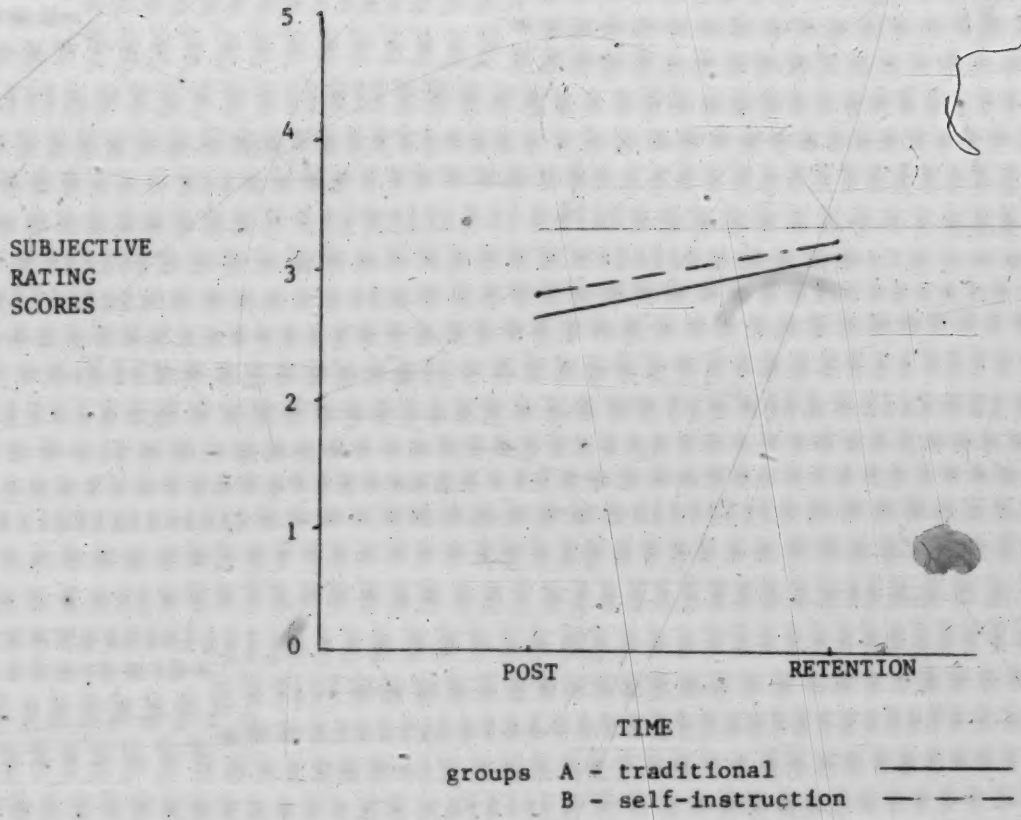

Figure 4

Serve Test Subjective Rating Results

test measuring accuracy and the subjective rating measuring form. The two tests then did not have a high positive relationship.

The high positive correlations recorded for the wall test and the subjective wall test ratings indicate that form may have been an important factor in determining the groundstroke ability level of beginning tennis players.

Chapter V

Summary, Conclusions, Observations and Recommendations

Summary

This study investigated the effectiveness of two methods for teaching beginning tennis. A review of related literature revealed a number of various tests used to measure physical skill and knowledge of tennis. Based on the review of literature, and the investigator's keen interest in tennis, a study was conceptualized and developed to compare an individualized self-instruction teaching method to a traditional teaching method for beginning tennis.

The population chosen for this study consisted of female university students. The final sample number consisted of twenty females who were beginners, as determined by a criterion at the beginning of the study. These females were divided into two groups of ten; they participated in seven one hour tennis lessons. In addition to the tennis lessons, the subjects were involved in a pre-test, post-test and retention-test session in which the various tests were administered. Testing for this study included a wall test to measure forehand and backhand stroke ability, a serve test to measure serve ability, a written test to measure tennis knowledge and a subjective rating to measure for in ground stroke and serve execution. Participant feedback in the form of 'comments' was

maintained to indicate subject enjoyment of the lessons.

The testing sessions and the tennis classes were conducted in a gymnasium. The format of each teaching method was planned to present the same material for each group but to present it in a different manner. The traditional group was taught by the instructor in the usual manner which was characterized by the teacher guiding the class through new material with an explanation, demonstration, and practice period. The self-instruction group utilized booklets to progress through the beginning tennis material. Student progress was monitored by the instructor as students progressed through the instruction objectives. Verbal reinforcement as to skill proficiency was given when the student came to the instructor to demonstrate her skills. Non-verbal reinforcement in the form of stars was put in the students' booklets as an indicator of progress made. For both groups, instructional materials including 8 mm film loops and a large laminated court diagram were used.

The results of this study indicated no significant difference between the groups for the wall test, serve test, knowledge test and subjective ratings. However, over time, there were differences between the traditional group and the self-instruction group. For the wall test the self-instruction group performed significantly better, from the pre-test to the retention-test session, than the traditional group. For the subjective rating of the serve test the self-

instruction group performed significantly better, from the post-test to the retention-test session, than the traditional group. These results may be an indication that the self-instruction group was able to recall the basis of tennis (during the retention-test session) which they had learned, and use them to perform better than the traditional group. This result was deemed by the investigator as a significant factor to consider if one of the goals of physical education programs is to prepare the individual with skills for participation throughout one's lifetime.

The results also indicated a high reliability for the judges on the subjective rating as measured by the Spearman-rank order correlation and percentage agreement.

The correlation of the subjective rating for the wall test to the wall test scores indicated a high relationship. That is, it appeared that good form was necessary to perform well on the wall test. On the other hand, the correlation of the subjective rating for the serve to the serve test indicated a lower relationship. This indicated that form was not necessary to perform well on the serve test.

The results of this study indicated that the self-instruction method developed for teaching beginning tennis definitely was as effective as the traditional method.

Conclusions

Within the limitations of this study, the following conclusions, with direct reference to the main and subsidiary problems as stated in Chapter I, are justified.

1. The individualized self-instruction method was as effective as the traditional teaching method used in this study.

2. The subjective ratings for the wall test were valid for measuring wall test performances. The subjective ratings for the serve test were not as valid as for the wall test in measuring serve test performance.

3. The group taught by the self-instruction method performed significantly higher on the retention test for the wall test and the subjective rating serve test.

4. The criterion-referenced knowledge test developed for this study was a reliable instrument for measuring beginning tennis knowledge.

5. As indicated by class atmosphere and feedback in the form of 'comments', both groups enjoyed the classes to the same degree.

6. The statistical null hypotheses (Chapter III) based on the research hypotheses (Chapter II) 1, 3, 4, 5, 6, 7, and 8 were accepted and the alternative statistical hypotheses based on the research hypotheses 2 and 9 were

accepted.

Observations

The following observations were selected for further discussion: knowledge tests, subjective ratings, retention tests and performance, participant comments as an indication of lesson enjoyment, and self-instruction teaching methods.

Knowledge Tests

Knowledge tests, such as the criterion-referenced (Singer, Dick 1974) one developed and administered for this study have greater value than merely the assignment of a grade to a student's paper. The results of a criterion-referenced test may indicate to an instructor what material the student does not understand, or where the lesson material is weak. The feedback gained by the instructor as to lesson material will allow the improvement of the material presentation and the students' understanding of the subject material.

Subjective Ratings

The subjective ratings were included in this study for two reasons. First, as supported by Neuman (1968) the author believed that a measure of form was an important factor in beginning skill acquisition. Form provides the proper technique for a participant to learn the basics and

eventually develop a higher level of skill and performance. This initial form acts as the ground work, the base to which any participant may refer.

Second, the use of the subjective rating was used to determine the relationship between form as measured by the ratings and accuracy as measured by skills tests. This relationship was found to be high for the wall test and the subjective rating during both the post-test and retention-test sessions. This finding added further support to the use of the wall test as a measure of beginning tennis skill. However, the low relationship reported for the serve test and the subjective rating only confirmed the need for the development of a beginning serve test which would measure form and accuracy.

Retention Tests and Performance

The results reported in Chapter IV indicated a significant increase in retention on the wall test (Table 3) and the subjective rating for the serve test (Table 7) for the self-instruction method. These were the only significant differences recorded between the two teaching methods over the testing times. It appears that retention was an important factor in the difference found between the two teaching methods.

An examination of the raw data found in Appendix G showed that a number of scores on the wall test and the

serve test for the retention-test were higher than those recorded for the post-test. An explanation of this increase in performance level after the four week interval cannot be attributed to practice as the study participants were told and reminded not to play or practice during this time. An investigation into the literature refering to retention performance levels (Singer, 1975, Singer and Milne 1975) shows that this phenomenon is not unnatural. Motor skills such as bicycle riding, swimming and tennis may be overlearned or overpracticed thus resulting in little if any forgetting. High retention levels for these gross motor skills may also be attributed to the fact that "there are fewer similar and thus interfering responses competing with motor skills" (Singer and Milne 1975, 259) as compared to verbal material.

It would seem that because retention of skill performance is an important factor to consider in sport participation throughout one's lifetime that further research should be employed in this area.

Participant Comments as an Indication of Lesson Enjoyment

The comments recorded in Appendix E were obtained from the subjects as a measure of lesson enjoyment. No scientific approach or statistical procedures were employed in this area of data collection. An interpretation of the feedback by the investigator led to the conclusion that the group

taught by the self-instruction method enjoyed the lessons as much, if not more, than the group taught by the traditional method.

Generalizations made from this specific study with reference to the self-instruction method, have to consider the age of the participants (18 to 27 years) which probably alleviated participant exposure to self-instruction methods prior to this study. Also to consider, was the time of year. The subjects were preparing for final exams and another book was probably the last thing they wanted to see when they arrived for tennis lessons!

The initial reaction of the self-instruction group was well expressed as indicated by the first and second day comments. Further comments showed that as the participants became accustomed to this method of instruction they settled into the program and quite enjoyed the lessons. The span of seven lessons was time enough for the instructor to note progress differences among the individuals. Some students were perfectionists and wanted to stay on one specific task, others chose to move along as soon as a minimal proficiency level was reached. These differences seemed to satisfy each subject. It was never expressed to the instructor that a subject felt 'behind' in the lessons.

The effectiveness of any teaching method, and in particular this self-instruction method, may be related to the method presentation by the instructor. For this study

the instructor attempted at all times to maintain a feeling of concern and willingness to help the student with the program.

Self-Instruction Teaching Methods

The literature reviewed in Chapter II provided evidence for studies done in the area of self-instruction programmed type methods; and more specifically, for tennis. The use of these methods designed for effective learning are not new. Lysaught (1963) reported that studies done in programmed learning do provide empirical evidence for method effectiveness, findings have shown that programmed learning can reduce student error, and may be a motivating factor due to student's immediate feedback of results.

Farrell (1970) reported that the programmed method employed in her study had merit as it placed the responsibility for learning on the student as well as allowed each student to progress at an individual pace.

One advantage of the programmed group as discussed by Neuman (1968) was the freeing of the instructor from formal teaching responsibilities. The teacher was then able to help each student individually when necessary. Neuman used assistants to monitor the programmed groups' progress.

The self-instruction method used in this present study was a combination of factors reported in previous studies.

This amalgamation was an attempt to measure the various behavioral components encountered in either a school or recreation teaching-learning environment.

Recommendations

Recommendations for further study include:

General

1. That research continue for effective methods of teaching physical activity. That these methods be designed to meet the needs of specific populatons within the physical educaton programs.

2. That this continual search be developmental in nature; that is, to build from one study to another.

3. That research carried out be kept as standardized as possible to avoid inaccurate data collection and interpretation.

4. That the standardized procedures be kept to as reaslistic a teaching - learning environment as possible.

5. That continued investigation be made into relative sub-disciplines of physical educaton in an attempt to add to the foundation of knowledge for the study of teaching methodology.

6. That research findings be made known to physical educators in the field through such media as publicaton, workshop or meeting.

Specific

7. That continued investigation be made into the

possibilities of self-instruction methods within physical education curriculum either as total units or as sub-units to be inserted into the existing program.

8. That skills tests (and in particular serve tests), subjective ratings, and knowledge tests be further developed to measure participant performance within the research.

9. That different variables such as age, sex, and length of instruction be included for experimentation.

10. That further reserch be carried out specifically for retention measures (of various lengths) for self-instruction programs for tennis and other lifetime sports.

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Appendix A

Women's Intramural

Indoor Tennis Lessons

WHEN: Tuesdays, Thursdays 5:00 - 6:00 p.m.
March 10-31
or
Tuesdays, Thursdays 6:00 - 7:00 p.m.
March 10-31

WHERE: West Gym. Physical Education Building
University of Alberta

These 7, 1-hour tennis sessions are part of a research study being conducted by a graduate student in the Faculty of Physical Education. Participants must be beginners according to the criteria listed below:

1. no previous high school, university recreational or professional instruction.

2. have not played more than 5 times in the past two years.

If you are available during the class times and would like to learn to play tennis please register either through your unit manager, at the Women's Intramural Office, or by phoning Sue Inglis at 434 0692 before March 7, 1977.

Rackets and balls will be supplied, you will be expected to wear running shoes. Attendance at all sessions is of prime importance. Registration is limited to 24 girls.

TENNIS REGISTRATION FORM

Name: _____

Address: _____

_____

Phone: _____

Tennis Experience: _____

_____

_____

Class Time:	Tuesday/Thursday 5:00 - 6:00 p.m.	Tuesday/Thursday 6:00 - 7:00 p.m.
	_____	_____
	_____	_____

Faculty: _____

****

- rackets and balls will be supplied.
- please wear running shoes.
- attendance at ALL SESSIONS is a must.
- participants should be available for a final session in the second week of May.

Reminder Card

Issued to each participant at the post-test session.

REMINDER TO: _____

TENNIS SESSION:

Monday May 9th 4:30 - 6:30 _____

6:00 - 7:00 _____

Please do not practice or play tennis until after this session.

Thanks --- See you then.

Sue Inglis

434 - 0692

Appendix B

SELF-INSTRUCTION BOOKLET

for

LEARNING BEGINNING TENNIS

GENERAL INFORMATION

This booklet contains information on how to play tennis. Besides the information in the booklet, there will be:

1) 8 mm film loops for you to look at.

2) a large court diagram to help you learn boundaries and areas of the court.

3) a drill card file which you will use to practice various strokes.

As was mentioned in class, these tennis sessions are part of some research being done at the University of Alberta. You then, are part of this research. Two points are very important to the success of this study. First, your attendance is a must. If you will not be able to attend all of the seven sessions, please let the instructor know. Second, your reactions to these classes are important - write them down at the end of each class. Extra pages at the back of this booklet have been included for your use.

INTRODUCTION

The purpose of this booklet is to allow you to progress through the fundamentals of tennis, at your own speed. That is, you will proceed progressively from one section to the next after completing a section's requirement.

The instructor is in the class to help if you have any problems, and to monitor the demonstrations of your skill proficiencies. The last three sections (see 8, 9, 10) dealing with scoring, etiquette and terminology should be read as early as possible and applied throughout the sessions.

The sections in this booklet include:

1. The Forehand Grip
2. The Ready Position
3. Ball Control
4. The Forehand Stroke
5. The Backhand Grip and Stroke
6. The Serve
7. Stroke Improvement
8. Scoring
9. Etiquette
10. Terminology and Court Diagram

READ the directions and material carefully; there is no rush!

You may now PROCEED.

THE GAME OF TENNIS

Tennis is a game which may be played in or out-of-doors. Tennis may be played by one person on either side of the net (singles) or by two people on either side of the net (doubles).

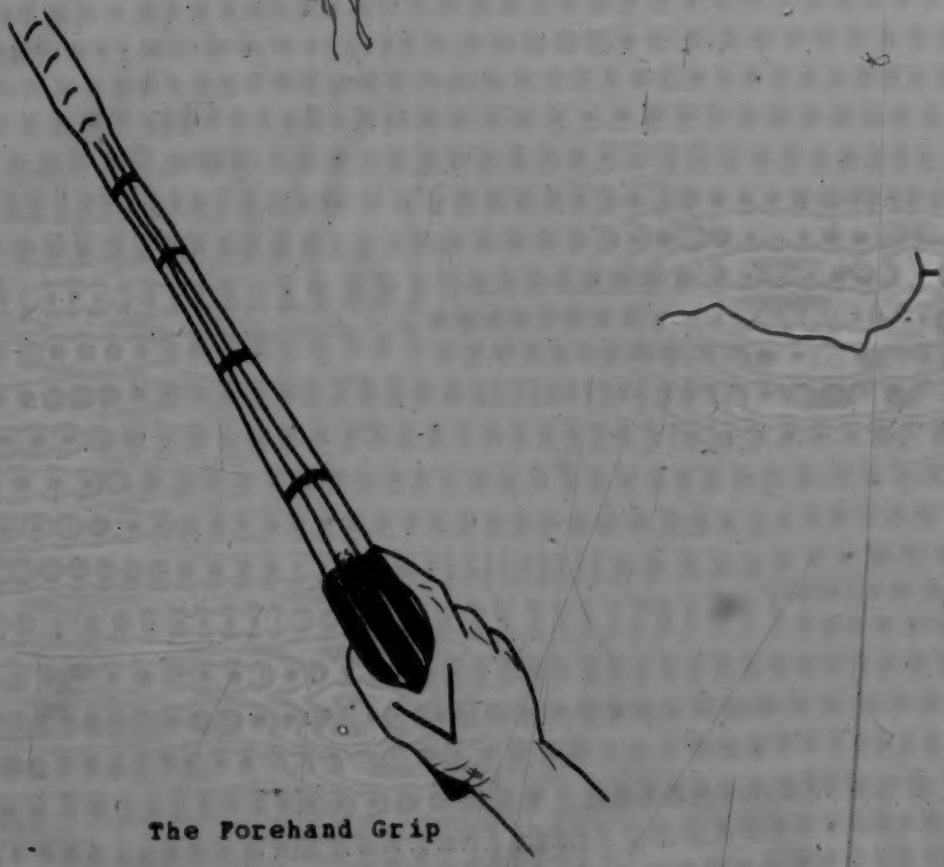
The game involves a serve to begin the point and a series of strokes or shots which are called a rally. The ball is usually hit after it bounces once but may be hit before it bounces. The two main strokes are the forehand (shot taken on the right side of a right handed player) and the backhand (shot hit on the left side of a right handed player).

Because the tennis court is quite large, there is a great deal of moving involved. One of the first things you will be introduced to is the "ready position". This "ready position" will help you to be prepared to move on the court and will make your strokes easier to execute.

The equipment used in this game involves a racket and balls. Clothing should be cool, comfortable, and conducive to physical activity. Tennis shoes are a must.

SECTION 1. THE FOREHAND GRIP

The forehand grip is used for the "ready position" and for the forehand stroke. This grip involves forming a "V" between the thumb and inder finger of your right hand. This "V" is then placed along the top bevel of the racket handle, the fingers are spread slightly, tightened and held in a "shake hands" position. The grip should look like this.



The Forehand Grip

CONTINUE on to Section 2 when you feel you have the correct forehand grip. If you are unsure, CHECK with the instructor; otherwise PROCEED to Section 2.

SECTION 2. THE READY POSITION

The "ready position" is the stance taken by the player before every shot and after every shot. The "ready position" involves:

a) feet, head and shoulders facing the net.

b) feet shoulder width apart.

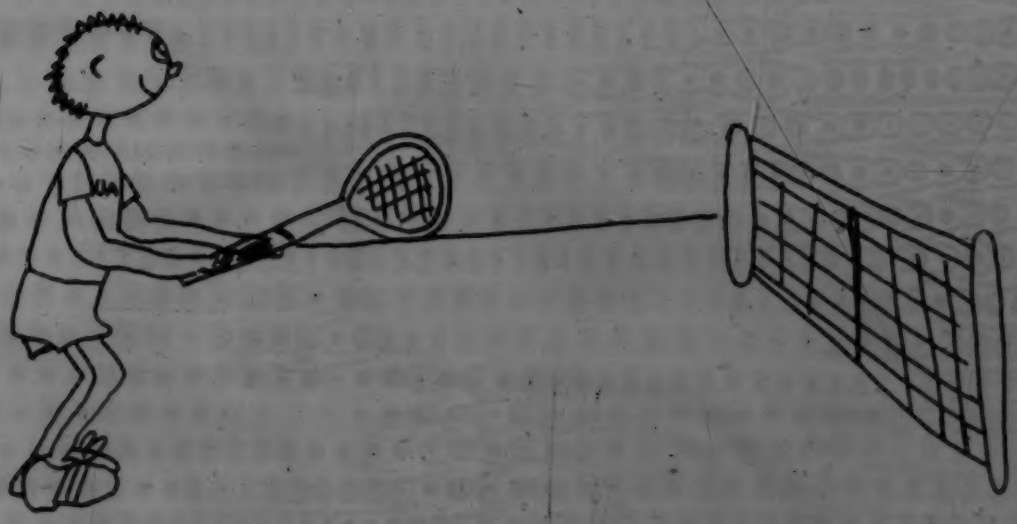
c) forehand grip with the racket supported by the left hand at the throat, (See Terminology - Section 10).

d) weight forward on the balls of the feet.

e) knees slightly bent.

f) eyes ahead watching the ball.

The "ready position should look like this.



The Ready Position

DEMONSTRATE the "ready position" and the forehand grip to the instructor. _____

Drill #1, the Shuffle Drill should be done by yourself or with a partner for at least two minutes. _____

Film Loop #3, "Position and Preparation" should now be viewed. _____

You may now PROCEED to Section 3.

SECTION 3. BALL CONTROL

This section is designed to give you practice handling the ball and the racket. The drills for this section are numbers 2 - 5. At least three drills should be SHOWN to the instructor and recorded before proceeding to Section 4.

Drill #2 BALL TAPPING DRILL (1) _____

Drill #3 BALL TAPPING DRILL (2) _____

Drill #4 BALL CONTROL EXERCISES _____

Drill #4 BALL CATCHING DRILL _____

You may now PROCEED to Section 4.

SECTION 4. THE FOREHAND STROKE

The forehand stroke is used to hit the balls that bounce on the racket side (right side for right handed players) of the body.

READ the following steps a couple of times before attempting the forehand stroke.

Using the forehand grip, and from the ready position the steps involved.

1. Pivot on the toes of the right foot so that the toes are pointing to the side of the court.

2. Guide the racket back so that it is in line with the body (180 degrees).

3. Step forward with the left foot.

4. Bring the racket through the shot (hitting the ball just in front of the left leg) so that it points toward the net.

5. Back to the ready position.

Points to remember when executing the forehand stroke include:

- eye on the ball
- turn the body side on to the net for the shot.
- racket head above the level of the wrist.
- firm wrist.
- hit through the ball from a low backswing to a higher follow through.

PRACTICE the forehand stroke without hitting any balls.

See if you can work through the five steps until you can put them all together in a very smooth, flowing action. DEMONSTRATE your forehand stroke to the instructor _____

Film loop # 4, "The Forehand Drive" should now be examined. _____

Drills #6 and #7 should be completed before proceeding to the next section. DEMONSTRATE the drills to the instructor.

Drill #6 _____

Drill #7 _____

You may now PROCEED to Section 5.

SECTION 5. THE BACKHAND GRIP AND STROKE

The backhand stroke is used to hit balls that bounce on the non-racket side (left side for right handed players) of the body

The grip used for the backhand stroke is obtained by turning the hand ("V") a quarter of a turn toward the thumb, so that the "V" is now along the top side bevel of the racket handle. The backhand grip should look like this.

The Backhand Grip

DEMONSTRATE your backhand grip to the instructor. You should be able to change from forehand to backhand and back to the forehand grip with ease. Use the left hand at the throat of the racket to guide the grip change.

READ the following steps a couple of times before attempting the backhand stroke.

From the "ready position" (remember to use the forehand grip in the "ready position"), the steps involved in the backhand stroke are:

1. Pivot on the toes of the left foot so that the toes are pointing to the side of the court.

2. Guide the racket back so that it is in line with the body (180 degrees). Change your grip to the backhand.

3. Step foreward with the right foot.

4. Bring the racket through the shot (hitting the ball in the front of the right leg) so that it points toward the net.

5. Back to the "ready position".

Points to remember when executing the backhand stroke include:

- eye on the ball.
- turn the body side on to the net for the shot.
- racket head above the level of the wrist.
- firm wrist.
- racket should be in a continuous line with the arm.
- hit through the ball from a low backswing to a higher follow through.

PRACTICE the backhand stroke without hitting any balls. See if you can work through the five steps until you can put them all together in a very smooth, flowing action.

DEMONSTRATE your backhand stroke to the instructor. _____

Film loop #5, "The Backhand Drive" should now be examined. _____

Drills #8 and #9 should be completed before proceeding to the next section. DEMONSTRATE your proficiency in the drills to the instructor.

Drill #8 BACKHAND WALL DRILL _____

Drill #9 PARTNER-TOSS BACKHAND DRILL _____

You may now PROCEED to Section 6.

SECTION 6. THE SERVE

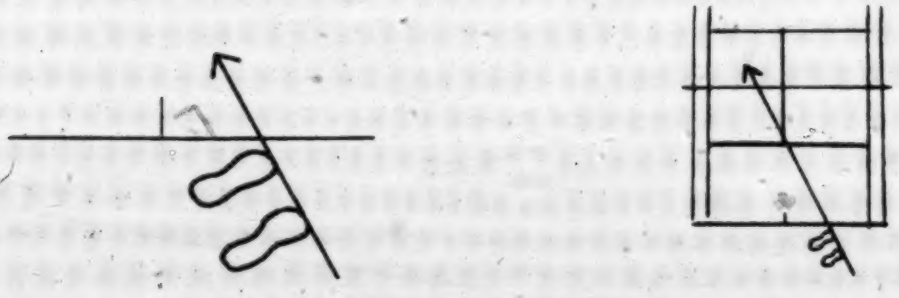
The serve is the stroke used to begin each point. The serve involves tossing the ball in the air and using the racket in a "throwing motion" to contact the ball above the head. This motion directs the ball to the proper serving area. The forehand grip is used for the serve.

The serve may be broken down into two main parts - the toss and the racket action. These will be discussed after the starting position is outlined. READ the instructions for the starting position and the steps involved before attempting the serve.

Starting Position for the Serve

The serve is executed from behind the baseline. For a right handed player, from the right side of the center line:

1. The feet should be shoulder width apart.
2. The left foot is positioned at a 45 degree angle to the baseline.
3. The right foot is positioned parallel to the left foot.
4. A line should be able to be drawn across the toes to the court of service, as shown in the diagram.



Starting Position for the Serve

A right handed player, when serving from the left hand side of the center line, follows the same procedure as for the right side serve.

In executing the serve from the starting position, the ball and racket start together, at waist height and are both brought down in the same motion. The ball is held in the left hand and the throat of the racket may be supported by the middle finger of the left hand. The steps involved in serving are:

The Toss

1. After the ball and racket are brought down to the left leg, the left arm is extended upward in a line directly out from the left shoulder.
2. As the left arm extends past the head, the fingers open to release or feed the ball into the air.
3. The ball should reach a maximum height equal to the racket extension.
4. If the toss were to drop, it should land approximately six inches in front of the left foot.

The Racket

1. The racket crosses the toes with an open face.
2. The racket is brought into the "back-scratch" position-elbow at shoulder height.
3. The racket then comes from behind the head to the point of maximum upward body and racket extension. It is at this point that the open racket face contacts the ball, directing it downward. The ball is contacted at its highest point in front of the left leg.
4. The racket follows through <u>across</u> the body.

5. Back to the "ready position".

Points to remember when executing the serve include:

- feet stationary to begin serve.
- toss or feed the ball into the air to a height of maximum arm and racket extension, the toss should be placed approximately six inches in front of the left foot.
- keep your eye on the ball at all times.
- follow through across your body.

With your racket and a few balls, GO to a practice area and:

1) work on the toss

2) work on the racket action

3) coordinate the toss and the racket action

Actual hitting should occur after the toss and racket action can be done correctly and smoothly without the ball.

DEMONSTRATE your serve to the instructor _____

Film loop #6, "The Service Stroke" should now be examined. _____

Drills #10 and #11 should be completed before proceeding to the next section. DEMONSTRATE your proficiency in the drills to the instructor.

Drill # 10 SERVICE-TOSS DRILL _____

Drill # 11 SERVE TO WALL DRILL _____

Drill # 12 ON COURT SERVE DRILL _____

You may now PROCEED to Section 7.

SECTION 7. STROKE IMPROVEMENT

This section is designed to give you an opportunity to practice the three strokes you have learned, as well as to improve the accuracy and control of your strokes. Movement during play will also be stressed.

Remember, that as you progress through these sections, you should be spending time on the last sections 8 - 10, which cover scoring, etiquette, terminology and a court diagram.

As was mentioned in an earlier section, the "ready position" is an important part of the game. The "ready position" allows you to move effectively on the court and gives you time to prepare for the stroke. Stroke preparation involves:

1) getting to the ball (or where it will be).

2) turning the body side on for the stroke.

3) getting the racket back.

Drills #13, #14, #15 and #16 should be completed in this section.

DEMONSTRATE your proficiency in these drills to the instructor.

Drill #13 PARTNER-TOSS FOREHAND AND BACKHAND DRILL _____

Drill #14 WALL RALLY DRILL _____

Drill #15 BALL CONTROL DRILL _____

Drill #16 SERVE-RETURN DRILL

You have now completed the seven sections dealing with the basic strokes and drills for beginning tennis. The sections to follow are also part of the lessons. You may review any drills which you like, or talk to your instructor about further material.

SECTION 8. SCORING

If you are playing singles or doubles, there are some general points to remember.

1. One person serves the whole game.

2. The Server's score is always said first. For example, if the score is 30 - 15, it means the server has two points and the receiver has one point.

The scoring of a tennis game is as follows:

no point - zero of love

first point - fifteen (15)

second point - thirty (30)

third point - forty (40)

fourth point - game

However, if both sides have three points (40 - 40), the score is called "deuce". When the score is deuce, one side must win by two consecutives points after deuce to win the game. For example:

Mary is playing Sally.

Mary is serving and the score is deuce.

If Mary wins the next point, the score will be "advantage-server".

If Mary wins the next point, after "advantage-server", she will have won the game.

If Mary loses the point after "advantage-server", the score will go back to deuce.

If Sally wins the next point after deuce, it is called "advantage-receiver".

If Sally wins the next point after "advantage-receiver", she will have won the game, if she loses that point, the score goes back to deuce.

A game may take approximately ten minutes to complete.

If you have any questions please ask the instructor.

Please indicate if you have read this section. _____

SECTION 9. ETIQUETTE

The following points are common court courtesies for the beginner, recreational player, or tournament champion. The courtesies marked with an asterick (*) have specific reference to these lessons.
Please ask the instructor for any interpretations.

GENERAL

1. Know the rules of the game.
2. Adhere to court regulations regarding tennis attire, time allotments, and tournament rules.
3. Introduce yourself and your partner to the people you are playing.
4. On busy days at the courts - play doubles; play should be limited to thirty minutes for singles and forty-five minutes for doubles.
5. After the games, thank and shake hands with your partner and opponents. If umpires or hostesses were present, thank them also.

ETIQUETTE PHRASES

1. "Heads up" - similar to "fore" in golf; is used when a ball may hit or land near a person not aware of the oncoming ball.
2. "A little help please" - used when assistance in returning a ball by anothre person is needed.

3. "One coming" - indicates to a player that a ball is on its way to them.

DURING PLAY

Server
* 1. The server should always have two balls to begin a point.

* 2. The server should wait until the receiver is ready before he serves.

* 3. The server should not serve the second ball until the receiver is back in his "ready position".

* 4. The server is responsible for keeping track of the score and for calling the score before each point.

* 5. Always say the server's score first.

Receiver
6. The receiver should always try to be ready for the serve.

7. The receiver should not return a ball that is out.

During Play
8. When playing without an umpire, players call balls on their side only.

9. Balls should only be called out - no comments on good balls.

10. Wait until the ball has bounced before making the call.

11. Doubtful calls on your side must be called "in" (no lets).

12. Interference (lets) must be called immediately e.g. ball rolling on court.

*13. Players should volunteer violations such as double hits, double bounce, touching the net or reaching over the net.

*14. Recognize good play by your opponent.

Court Interruptions

15. When returning balls to another court wait until that court has finished the point, then give the ball to one of the players.

16. Wait until play has stopped before requesting assistance from that court.

17. Always wait until play has stopped before walking behind a court; excuse yourself and move quickly and quietly.

Net Exchange

18. When exchanging sides at the net allow ladies and older players to pass first.

20. When exchanging sides leave the balls at the baseline or hand them to the players.

SPECTATORS

1. Should refrain from:

a) Applauding errors.
b) Moving about behind the court while a point is being played.
c) Talking loudly.
d) Coaching the players.
e) Calling the lines.
f) Returning balls during play.
g) Making noise while play is in progress.

2. Spectators should save the clapping until the end of the point. Applause for good play regardless of who wins the point is well respected.

Please indicate if you have read this section. _____

SECTION 10. TERMINOLOGY AND COURT DIAGRAM

It is important to know and understand the language of tennis. The following terms have been categorized for your convenience. The court diagram will aid you in identifying the lines and areas. Please ask the instructor if you have any problems. The items marked with an asterick (*) have special reference to these lessons.

COURT

*Alley	The area between the singles sideline and doubles sideline.
*Baseline	Boundary line at each end of court.
*Center Mark	Mark that bisects the baseline to indicate limit of the proper service area.
*Center Service Line	Line down the center of the court that separates the service courts.
*Court	The area of play inside the lines.
*Doubles Sideline	Outside boundary line at each side of the court used for doubles play.
*Fore-Court	The area up near the net.
*Service Line	Line parallel to the baseline which designates area into which the service must be made.
*Singles Sideline	Inside boundary line at each side of the court used for singles play and

as boundary line for all serves.

SCORING

Advantage	Point following deuce.
*Advantage-server	Indicates that the server has won the first point after deuce.
*Deuce	Term used to indicate an even score when each side has won three points - eg. 40 - 40.
Double Fault	Failure to make a good serve on two consecutive attempts.
Fault	Failure to make a good service.
*Fifteen	First point.
*Forty	Third point.
*Game	The winning of four points before opponent wins three or by winning two consecutive points after deuce.
Let	Service or point that is replayed.
*Love	Zero or nothing.
*Thirty	Second point.

STROKES

Ace	A legal serve that the receiver is unable to touch.
*Backhand	Stroke used to hit balls on the left side by a right handed player and on the right side by a left handed player. (non-racket side).

*Courtesy Stroke	Starting a rally by hitting the ball with a forehand stroke.
Cross-Court Shot	A ball hit from the corner or side of one diagonally across the net to the opposite corner or side.
*Drive	A shot hit with a full stroke either forehand or backhand after the bounce.
*Forehand	Stroke used to hit balls which come to the racket side of the body.
Grooved Stroke	A stroke with which the player is so familiar that he performs it automatically.
*Serve	The stroke used to put the ball into play at the beginning of each point.
Smash	A hard and fast downward shot made with an overhead stroke.
Volley	The stroke used to hit the ball in the air before it has bounced.

RACKET

*Face	The hitting surface of the racket.
(a) open face	Racket turned so the hitting surface is facing upward.
(b) closed face	Racket turned so the hitting surface is facing downward.
(c) neutral face	(Neutral) hitting surface of racket

	facing the net (parallel).
Handle	The end portion of the racket shaft, covered with a leather grip.
Head	The part of the racket above the throat which includes the frame and the strings.
*Throat	The part of the shaft below the racket head.

GAME

Baseline Game	Player stays on or near his baseline when playing, seldom coming to the net.
Deep	A shot that lands near the baseline.
Down the Line Shot	A ball driven parallel and close to the sideline.
*Doubles	Play with two people on each side of the net.
Long	Shot that lands beyond the baseline outside the court.
Love Game	A game in which the loser has not won a point.
Mixed Doubles	Game in which a man and a woman play as partners on each side.
Net Game	Type of play in which a player gets to the net as soon as possible to volley.

Placement	Shot placed accurately out of reach of the opponent.
*Rally	Continued play between the serve and the winning of a point.
*Singles	Play with one person on each side of the net.
*Toss	Spinning the racket at the beginning of a match to determine choice of serving or receiving first, or choice of sides.
Wide	Shot that lands beyond the sideline outside the court.

INSTRUCTION

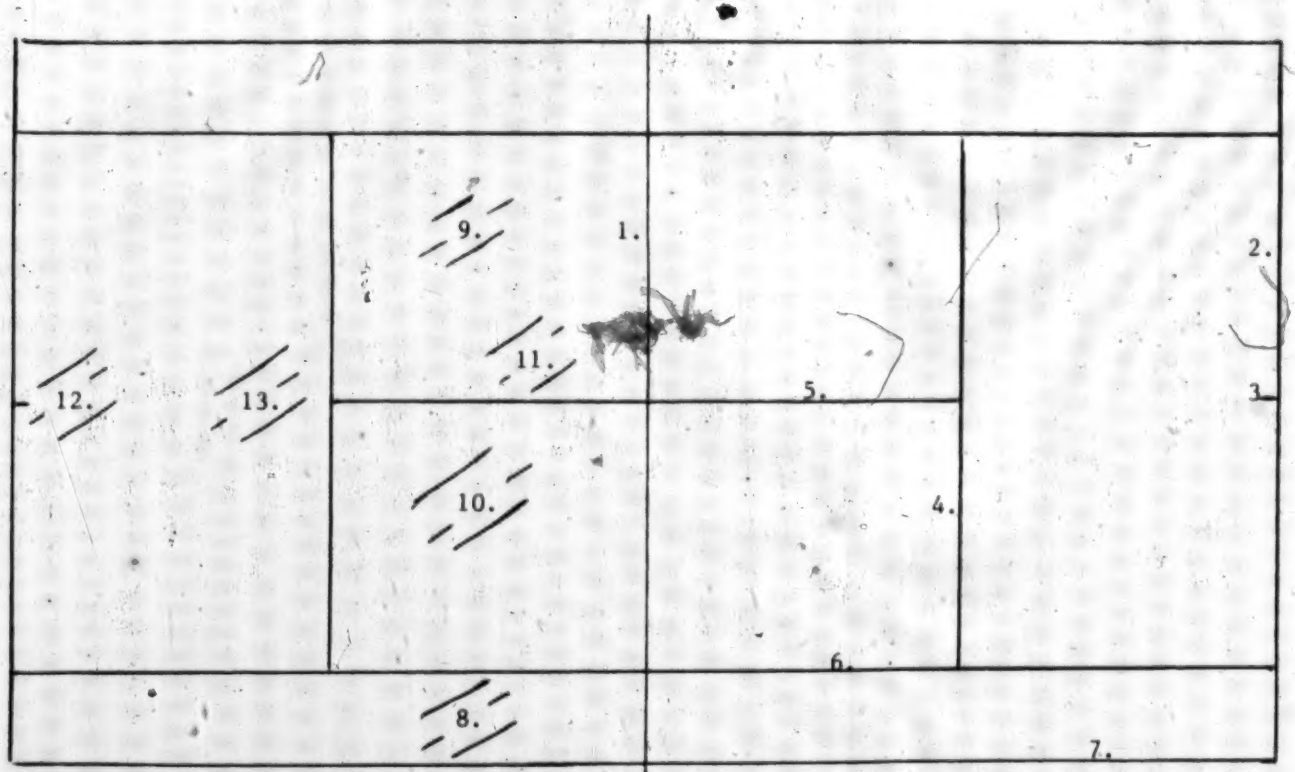
*Peeding	It is used in reference to placing the ball in the air on the service toss.
*Follow-Through	The motion of the arm and racket after the ball has been hit.

Please indicate if you have read this section _____

Film loops #1 and #2 may now be examined. _____

COMMENTS

Tennis Court Diagram



1. Net
2. Baseline
3. Centre Mark
4. Service Line
5. Centre Line
6. Singles Side Line
7. Doubles Side Line
8. Alley
9. Left Service Court
10. Right Service Court
11. Fore Court
12. Back Court
13. "NO-Man's-Land"

DRILL CARD FILE

#1 SHUFFLE DRILL

PURPOSE: This drill will give you practice in moving efficiently while holding the racket correctly.

EXECUTION: By yourself or with a partner assume the proper "ready position". Shuffle, with small sliding steps left, right forward and back over a large floor space. You should always be facing the imaginary net. This drill should be practiced for 2 minutes.

REMEMBER: forehand grip
racket supported at the throat with the left hand
knees bent
shuffle (no cross over steps)
keep your body weight low

#2 BALL TAPPING DRILL (1)

PURPOSE: This drill will give you practice in controlling the ball as you hit it to the floor with your racket.

EXECUTION: In a free space of the gym, standing in a stationary position, try the following. With the forehand grip, palm of your hand facing the floor (strings parallel to the floor), bounce the ball with the racket. Bounce the ball with control: low, high, slow and fast. When this can be done 50 consecutive times try moving while bouncing the ball. 50 more times on the move is a good start.

REMEMBER: Watch the ball at all times, and USE the WHOLE ARM as opposed to just the wrist.

#3 BALL TAPPING DRILL (2)

PURPOSE: This drill will give you practice in controlling the ball as you tap it in an upwards direction with your racket.

EXECUTION: In a free area of the gym, standing in a stationary position, try the following. With the forehand grip, turn the palm so that it faces the ceiling, bounce the ball in the air with the racket. Bounce the ball with control: low and high. When this can be done 50 consecutive times try moving while tapping the ball, 50 more times without a miss and no people collisions is good.

REMEMBER: Use the whole arm, keep your wrist firm and your eye on the ball.

#4 BALL CONTROL EXERCISES

PURPOSE: These two exercises will help you acquire "a feel of the ball".

EXECUTION: In a free area of the gym try:

a) tapping the ball to the ground with the rim of the racket head. Use the forehand grip. Try to keep tapping the ball 10 consecutive times.

b) pick up a ball by either tapping it with the strings till the ball bounces high enough to catch or pick the ball up by bracing the ball to the side of your foot with your racket and lifting. See if you can pick up 3 balls.

#5 BALL CATCHING DRILL

PURPOSE: This drill will give you practice getting accustomed to watching the ball, as well as finding out the bounce and size of the ball.

EXECUTION: With a partner or by yourself (using a wall if by yourself) have a game of catch. Try to watch the ball at all times. Try various heights, speeds and types of throwing. For example, try bounce passes. This drill should be practiced for 5 minutes.

#6 FOREHAND WALL DRILL

PURPOSE: This drill will give you initial practice in the forehand stroke.

EXECUTION: Position yourself about 10-15 feet from the wall in a free part of the gym. Standing side on to the wall (left shoulder to the wall), drop the ball waist height and in front of your left leg. Execute the proper forehand stroke as you hit the ball to the wall. The ball should be stroked so it hits the wall about 3-6 feet in height. Catch the ball on the rebound. Repeat. Progress this drill to include: beginning from the ready position, standing further back from the wall but not to exceed 25 feet. This drill should be practiced until 10 good forehand strokes have been hit.

REMEMBER: Review the points to remember on the forehand stroke in Section 4 of your booklet.

#7 PARTNER TOSS FOREHAND DRILL

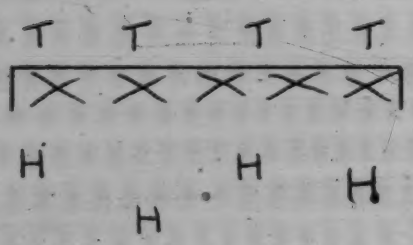
PURPOSE: This drill will give you practice in hitting balls over the net using the forehand stroke.

EXECUTION: With a partner, either at the net or in a free area of the gym, practice the following. Have one partner (with a few balls) at the net, toss balls over the net to the other partner who is positioned approximately 10 feet from the net. The toss is as important as the hit. The toss should be an underhand throw of the ball so that it lands ahead and to the right of the hitter. The hitter should be able to stroke through the forehand with very little movement. Try 15 tosses and forehand strokes each.

DIAGRAM:

T = tosser

H = hitter



#8 BACKHAND WALL DRILL

PURPOSE: This drill will give you initial practice in the backhand stroke.

EXECUTION: As the drill #6, position yourself about 10-15 feet from the wall in a free space of the gym. Standing side on to the wall (right shoulder to the wall) drop the ball at waist height and in front of your right leg. Execute the proper backhand stroke as you hit the ball to the wall. The ball should be stroked so that it hits the wall 3-10 feet in height. Catch the ball on the rebound and repeat. Progress this drill to include starting from the ready position, and moving further back from the wall (no further than 25 feet). Try to hit 15 good backhand strokes.

#9 PARTNER-TOSS BACKHAND DRILL

PURPOSE: This drill will give you practice in hitting balls over the net while using the backhand stroke.

EXECUTION: With a partner either at the net or in a free space of the gym, practice the following. have one partner with a few balls at the net toss the ball to the other partner's background. The hitter should be about 10 feet from the net on the other side. The hitter should be able to execute the backhand with very little travelling. Try to hit 15 good backhands each.

REMEMBER: The tosser should toss the ball to where the hitter will hit the ball. The hitter should stroke through the ball with accuracy and control back to the tosser.

#10 SERVICE-TOSS DRILL

PURPOSE: This drill will give you practice in the development of a well-placed toss for the serve.

EXECUTION: By yourself, with a few balls, find a free area of the gym. No wall needed. Remembering the correct serve toss, try a few to see if you can get the ball to reach a height of maximum racket extension. Now, place the racket on the floor so the head is just in front of the left foot. Practice the toss, allowing the ball to drop. See if you can hit the racket head 10 times.

REMEMBER: Place the ball in the air with the arm extended.

#11 SERVE TO WALL DRILL

PURPOSE: This drill will give you initial practice in serving the ball.

EXECUTION: By yourself, take a few balls to a free area of the gym with a wall and try the following. After a few practice tosses and serve swings, stand about 15 feet from the wall. Try serving the ball to the wall so that it lands above the 3 foot line. Try serving 10 good serves to the right and 10 good serves to the left of your starting position.

REMEMBER: When you are on the court serving, your balls will be travelling at an angle. Start each serve from the correct stationary starting position.

#12 ON THE COURT SERVE DRILL

PURPOSE: This drill will give you practice in serving the ball as well as introducing the desired distance and direction of the serve.

EXECUTION: By yourself with a few balls, position yourself in the serving position behind a baseline. Find an area of the court in which you will not be hitting or aiming at anyone. Practice your serving to both the right and left service courts. See if you can get 10 good serves in both courts.

REMEMBER: Ask the instructor if you have any questions.

#13 PARTNER-TOSS FOREHAND / BACKHAND DRILL

PURPOSE: This drill will give you practice in hitting forehands and backhands, deciding which stroke to use, as well practice in moving for the shot.

EXECUTION: As with the drills #7 and #9, find a partner who is at the same stage in the booklet, find a free space on the court and practice the following. With one partner on either side of the net, have one partner with a few balls, toss the balls to the person's forehand and backhand. Mix-em up a little. See if you can make the hitter move to return the shot. The hitter may move further back from the net once she begins to return the shots with accuracy and control to the tosser. Exchange positions after 15 hits.

REMEMBER: Try to use good form in your strokes. Before and after every shot assume your 'ready position'.

#14 WALL RALLY DRILL

PURPOSE: This drill will give you practice in developing your forehand and backhand strokes, your body movements and rallying abilities.

EXECUTION: As with drills #6 and #8, position yourself approximately 10 feet from the wall. Attempt to rally the ball continuously off the wall. See if you can have a rally of 50 consecutive forehand and backhand strokes.

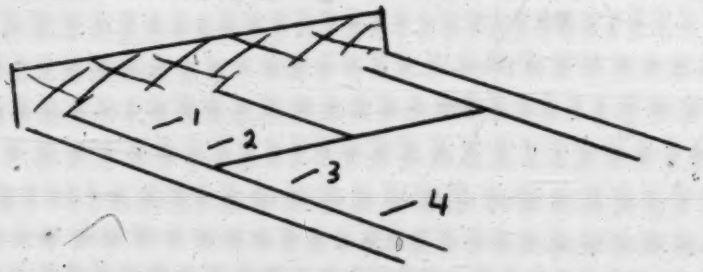
REMEMBER: Try to use the proper stroke form. Ask the instructor if you are having any troubles.

#15 BALL CONTROL DRILL

PURPOSE: This drill will give you practice in controlling the ball while on the court at varying distances from the net.

EXECUTION: With a partner, position yourselves one on either side of the net about 4 feet back from the net. Both players should have one or two balls. The object is to rally back and forth over the net 10 consecutive times with the ball landing within the 4 foot area. Progress your court position to the 8 foot mark and once again using the correct forehand and backhand strokes rally the ball 10 times. See if you can progress to the baseline.

DIAGRAM:



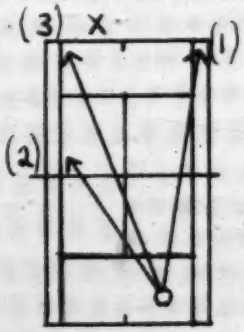
REMEMBER: The key to good ball control near the net in this drill will be to hit the ball so it clears the net by approximately 3 feet. Keep the racket head above the level of the wrist, bend the knees, and keep your eye on the ball.

#16 SERVE-RETURN DRILL

PURPOSE: This drill will give you practice in serving and returning the ball as in a game situation.

EXECUTION: Position yourself on the court diagonally opposite from your partner. X will serve to O. O will return the ball down the side line and out of X's way. (1) This drill will give the server practice as well as practice in returning the serve to the receiver. If the court is not busy O's will return could be to the right front corner (2) or cross court to the back right corner (3). Exchange servers after 5 successful serves to each court.

DIAGRAM:



X = server

O = receiver

Appendix C

First Session Procedures

Both Classes

1. Introduction of myself.
2. Attendance.
3. Brief orientation to lessons and study.
   - Two groups learning the basics of tennis using two different methods.
   - this class is being taught:
     a) the traditional method of teaching tennis
     b) a self-instruction method where the instructor monitors each individual's progress. You will each be given a booklet to use for the lessons. I will be here to help and to answer any questions you have.
   - This study then, is the same as a regular class only a few exercises or tests are being conducted to compare method effectiveness.
   - you must remain in the class in which you have registered.
   - It is important that you make every attempt to attend all sessions.
4. Explanation of first day proceedings.
   - the measures taken today include:
     a) height
     b) weight
     c) a wall hitting exercise

d) a serve exercise

5. Format of the lessons.

- the first and last session will be spent on completing the exercises. The last session will also involve a knowledge test. This test is designed to measure what you have learned about tennis in your lessons.

6. No need to study.

No out-of-class practice.

7. Testing.

8. Bring the class together.

- answer questions
- give my phone number
- thank them
- see them on Tuesday

Class Outline for Traditional Method

Session

1 Class procedures as outlined

Pre-tests

2 Brief description of the game

Ready position, drill #1

Forehand grip

Ball control drills #2, #3, #4, #5

Forehand stroke and drills #6, #7

3 Review of ready position

Review of forehand stroke

Backhand grip, stroke and drills #8, #9

Etiquette

4 Review and practice of forehand and backhand stroke and drills #13, #14

Serve toss and drills #10, #11

Court diagram

5 Review and practice of serve toss

Serve and drills #10, #11, #12

Forehand and backhand practice

Scoring

6 Practice forehand, backhand, serve and drills #15, #16

Basics of the game

7 Review of forehand, backhand, serve

Practice of strokes

8. Post-tests

9 Four week retention-tests

Appendix D

TENNIS QUIZ

All questions should be answered for a RIGHT HANDED player.

MULTIPLE CHOICE

Select the one item which best answers the question. Circle the number corresponding the correct answer.

1. The 'ready position' is the stance taken:

   1. As you hit the ball.
   2. When you change ends of the court.
   3. Before every shot, and after every shot.
   4. When you are waiting to go on the court.

2. When executing the forehand or backhand drive, the racket should be:

   1. Brought back in line with your body.
   2. An extension of your arm.
   3. Held at the handle.
   4. All of the above.

3. When executing any stroke in tennis you should be watching:

   1. Your feet.
   2. The net.
   3. The ball.
   4. Your opponent.

4. For a good serve toss, the ball should be tossed to the height of:

   1. One foot above the head.
   2. The length of the racket above the shoulder.
   3. Two feet above the head of the racket with the arm extended.
   4. The top of the racket with the arm extended.

TRUE - FALSE

If the statement is true, circle the T. If the statement is false, circle the F.

T F 1. Lack of control on the ground strokes may be due to failure to maintain a firm wrist when hitting the ball.

T F 2. A served ball which lands on the opponent's centre service line is good.

T F 3. Ideally, for the ground strokes, the ball should be hit at waist level.

T F 4. If the serve toss were allowed to drop to the ground, it should land approximately six inches in front of the left foot.

T F 5. Scoring in tennis is: love, fifteen, thirty, forty, fifty.

T F 6. The backhand grip is often refered to as the 'shake hands' grip.

T F 7. Touching the net during play is a violation.

FILL IN THE BLANKS

Write the appropriate word(s) in the blank to complete the statement.

1. If Mary executes a forehand drive across the net to Sally's non-racket side; Sally should use a _____ (forehand, backhand) stroke to return the ball.

2. The _____ is the motion of the arm and racket after the ball has been hit.

3. If both sides have 3 points (40 - 40) the score is called _____.

4. The forehand stroke is used to hit balls that bounce on the _____ side of the body.

5. The stroke that is used to begin every point is taken from behind the _____ line.

6. The area between the singles sideline and doubles sideline is called the _____.

7. If Mary is serving and wins the first 2 points against

Sally, the score is _____.

8. For a right handed player, the follow through fof the serve is to the _____ side of the body.

9. If a player serves the ball into the net when executing the serve, it is called a _____.

10. When the ball approaches on your right, the body should turn to the _____. (left, right)

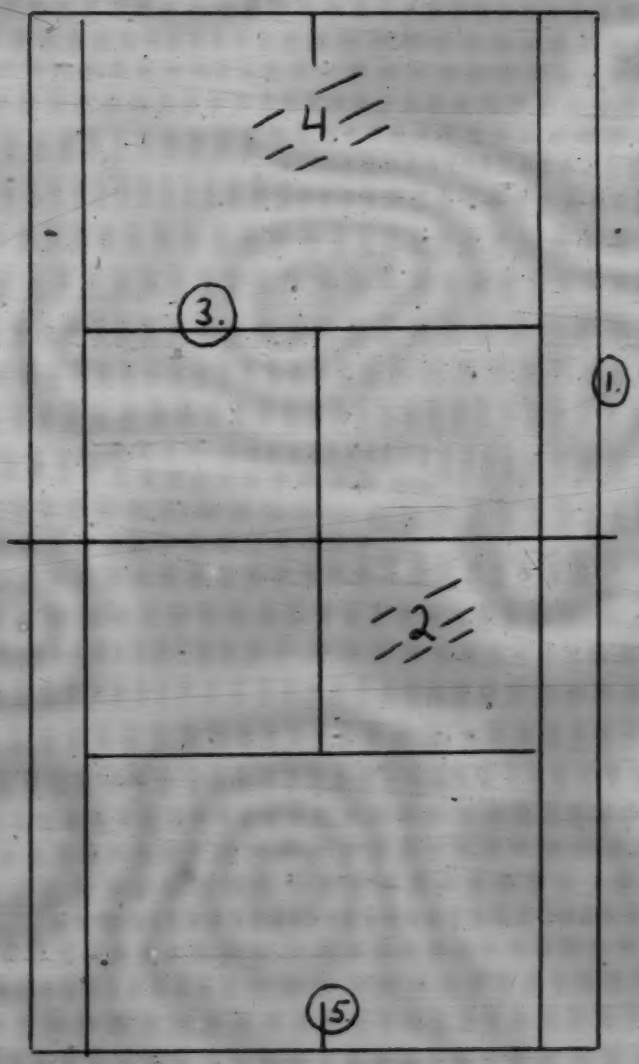
11. The body weight should transfer from the _____ foot to the _____ foot when executing a forehand drive.

12. After the serve, a series of strokes or shots is called a _____.

COURT DIAGRAM

Using the numbers on the court diagram, identify the line or area indicated.

1. _____
2. _____
3. _____
4. _____
5. _____



TENNIS RECORD SHEET

Name: _____

Class: _____

****

PRE-TEST

Height _____ Weight _____

Backboard #1 _____ #2_____ #3_____

T= _____ A= _____

Serve #1 _____ #2_____

T= _____

****

POST-TEST

Backboard #1 _____ #2_____ #3_____

T= _____ A= _____

Serve #1 _____ #2_____

T= _____

Written T= _____

Subjective Judge #1 = _____ (T)

Judge #2 = _____ (T)

Judge #3 = _____ (T) T= _____

****

RETENTION-TEST

Backboard #1 _____ #2_____ #3_____

T= _____ A= _____

Serve #1 _____ #2_____

T= _____

Subjective Judge #1 = _____ (T)

Judge #2 = _____ (T)

Judge #3 = _____ (T) T= _____

TENNIS JUDGE'S SHEET

Judge's Name _____

Person Rated _____

****

Rating		Criteria
Very Poor	(1)	No form or evident stroke production used. No accuracy or control in the stroke.
Poor	(2)	Some form but no conscious effort to execute form. Very little control or accuracy of the stroke.
Average	(3)	Conscious effort to use good form but not always successful. Some control but balls hit with varying accuracy.
Good	(4)	Conscious and usually successful attempt to execute form. Most balls hit with accuracy and control.
Excellent	(5)	Conscious and successful attempt to execute form. All balls hit with accuracy and control.

****

Post - test

Forehand _____

Backhand _____

Serve _____

Total _____

****

Retention

Forehand _____

Backhand _____

Serve _____

Total _____

Wall Test Instructions

Wall Exercise

You will begin this exercise standing behind the restraining line, which is 20 feet from the wall. You should be holding 2 balls to start.

When I say 'begin' put the ball into play by hitting it to the wall with any stroke. You are trying to hit the ball to the wall as many times as you can in 30 seconds. I start the watch when you make the first successful hit.

Remember:

- the ball may bounce once, more than once, or not at all.

- for the ball to be good it must be hit from behind the 20 ft. line and must land on or above the 3 ft. wall line and on or within the side wall and floor boundaries.

You will be given 3, 30 second trials.

Serve Test Instructions

Serve Exercise

Begin this exercise from behind the baseline to the right of the center mark.

You will serve 4 points. Alternate sides of the center mark after each point. Just as in a game, you will have 2 trys per point to serve the ball in the proper serving area.

Remember:

- if you get the first attempt in the correct area, you move to the next point.

- 'let' balls will be replayed (if the ball hits the net and lands in the proper area it is called a 'let').

- the ball should be served with the overhead throwing arm action as taught in class.

You will serve 2 - 4 point trials.

Appendix E

Comments

Taken from the Traditional Classes

Lessons 1 and 2

"I found it difficult to get a good swing using the step-by-step method. Refers mainly to the backhand, otherwise I am doing fine."

"I found the drills were good - the practice was beneficial. Review was good and thorough."

"Review on forehand was needed. It was a good refresher. The approach to the backhand was straight forward and thorough."

Lessons 3 and 4

"A very good class. Tossing drills I found were very useful."

" Techniques of the drills used today, I think were very effective in developing the serve."

"Very good drill for the forehand drive! It really tested how much we could do. Also two good drills for the ball toss, you can really get the 'feel' that way."

"I found the station idea was super. Especially the forehand on the court. It makes good use of the space and accomodating people!"

Lessons 5 and 6

"Thought today's lesson was well-planned. Utilized area well."

"Lessons helpful."

Lesson 7

"I have enjoyed these lessons. I feel that I have really benefited from the instruction and the drills used. Now, all I need is a lot of practice, hopefully."

"Overall - the course is very good. I've learned a lot - enjoyed it too - which I don't really do when I'm learning!"

"I thought the lessons were well-planned. I think they would have been better if there had been time for more individualized instruction besides the group lessons, it would have been better. The course itself was very practical and provided all the basics."

"I really enjoyed the lessons. I found them very informative. Two many times when you take lessons in a sport, the instructors assume that you know things even though you're a beginner. This was not the case here. All beginning aspects of the game of tennis were thoroughly covered, ie., grip, toss, foot stance. A really good course. Instructress was very patient, pleasant and willing to help

when needed."

"Instructor always very helpful, low pressure. Good individual instruction considering numbers of students. Film loops not useful. Would have been nice to have more actual practice on a court."

"The practice time at the beginning of the sessions is good - gives a chance to limber up and get warmed up."

"The teaching was good. There could have been more on the rules and scoring."

"I found all the lessons to be explicit and very helpful. The skills helped with the actual game play. Practice at the forehand and backhand really helped. The atmosphere in class and your teaching techniques were good, I learned a lot."

"They were really good in that they stressed skills necessary for good tennis. The only thing that could have helped facilitate carryover of skills to game situations would be more time on the court."

Comments

Taken from Self-Instruction Booklet

Lesson 1

"In advance a bit confusing about how to start, later I liked doing it."

"Initially, was surprised with program unit but after getting started with it, seems to work out well. Enjoyed the drills."

"This is different than I expected, using these booklets, but I can see how they will prove to be very useful and an efficient way of teaching us."

"My initial reaction to the type of lesson was, oh no - another book! But I can see the benefit of working at my own speed plus the drills with a visual loop presentation were really good."

Lesson 2

"I liked working at my own speed."

"Already note improvement in myself, I feel I can control the ball more. Enjoyable class but went too fast!!"

"Things seem to make more sense now."

"Sometimes I wish I could move along faster but I

suppose it takes time to get it right."

"No critism - it was good today!"

Lesson 3

"Film was quite helpful in illustrating forehand stroke - lots of help from Sue today which I needed."

"Like the step-by-step encouragement (I need it!)."

"Again today went well, - it's very enjoyable."

"The session went well, you were there when I was ready to be tested. I think this program should work well. It takes time by myself to get the strokes perfected, or at least learned."

Lesson 4

"Portunately I found I missed very little when I was away. By making up the 1st class time I was able to catch up to the others."

"Again, the film really helps in showing footwork."

"Might be better to see film before trying the strokes."

"Seems to be coming along, am really enjoying it."

"It is fun to play!"

"I felt that things went well, I feel I am moving along at a good pace, I even think I am improving. I wish I had more than one hour."

Lesson 5

"I like to see the film before I start practicing a drill, because of the clearance."

"Seemed to accomplish a lot today."

"Liked the book idea as I missed part of the class but was able to stay and still progress on my own for an extra fifteen minutes after class."

"The film is good, one hour practice seems short for me, instructor is helpful."

Lesson 6

"Backhand was much better today. Finished that. Worked more on my serve. Read section 8, 9, and one-half of 10.

"Really enjoyed today. Step-by-step instruction very helpful, points out weaknesses and areas that I need to work on - find the instructor very patient and guiding."

"A lot of terms in parts 8, 9, and 10 were familiar, but even unfamiliar areas were straight forward and easy to understand."

"Everything is okay."

Lesson 7

"The course itself was very enjoyable. The booklets were just great. There were times when I wanted to review and it was nice to be able to check up."

"I enjoyed these lessons very much and for the length of time we had I sure learned a lot. The instructions for the grips and strokes were explicit and were complemented well by the films."

"Beginning to feel functional." Good idea to review strokes and terminology etc. Have really enjoyed tennis and hope to continue this summer."

"Enjoyed the lessons."

"I wish there was more time after all the basics to try playing a game."

"Really wish we could get into a singles or doubles game but it looks impossible."

"I think we should have had about two more lessons so we could have run thru the stroke improvement and practiced rallying with another player or two. Maybe some time for games too. I suppose that wouldn't have worked with that many people. Still great to learn - and ready for summer."

Appendix F

Description of Teaching Facility

1. Wall test area.
2. Practice test area.
3. Regulation size tennis court.
4. Chalk boards.
5. Table and benches-for class talks.
6. Benches for judges' viewing.
7. Mesh curtain for serve practice.
8. Practice lines (net height) on walls.
9. Gymnasium entrance.
10. Storage room used for film room.

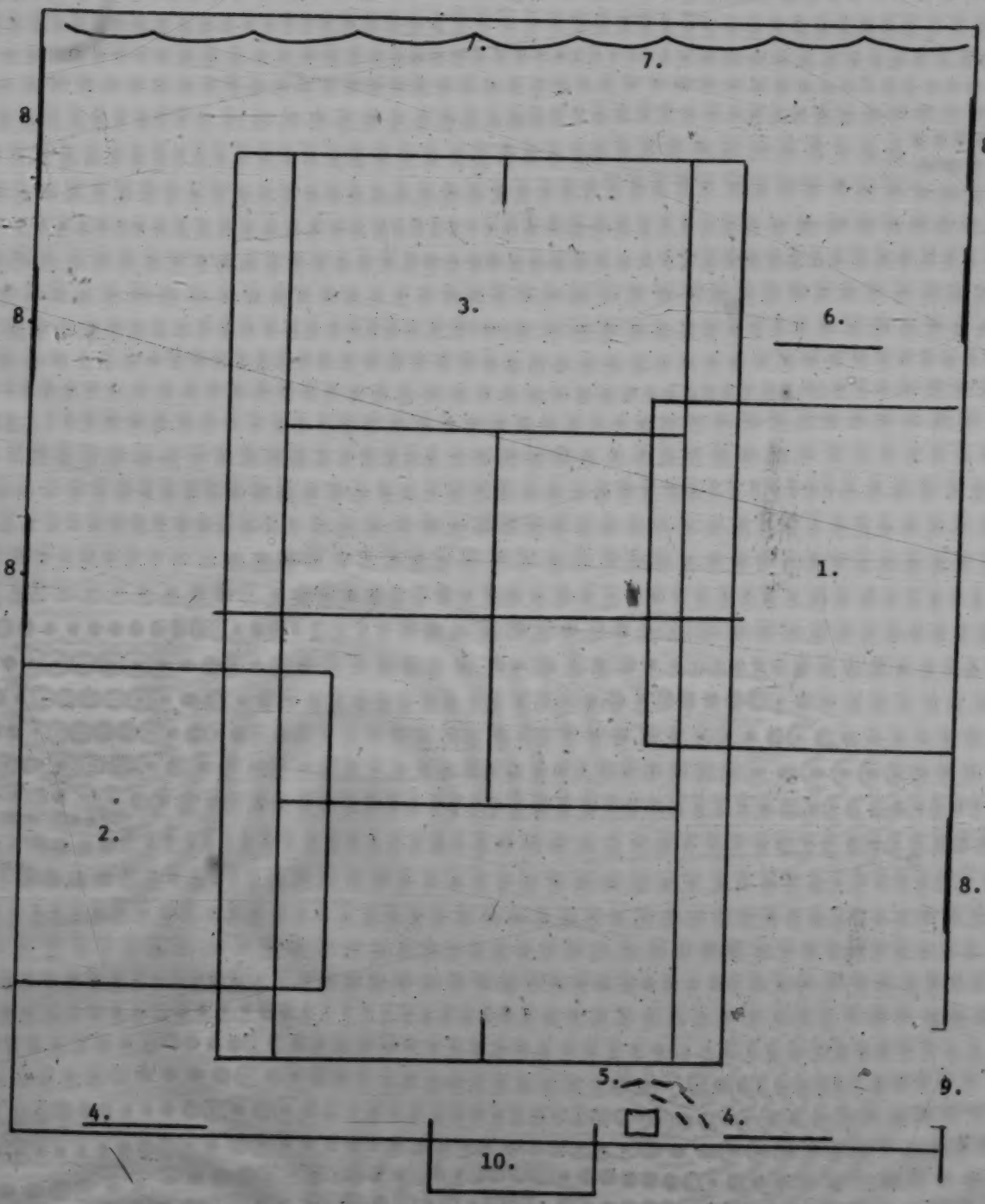


Diagram of Teaching Facility

Appendix G

Raw Data

Wall Test

(Scores are recorded as total of 3-30 second trials)

Subjects	Pre-test	Post-test	Retention-test
Traditional Group			
S(1)	23	31	33
S(2)	36	28	29
S(3)	22	31	30
S(4)	23	18	17
S(5)	22	32	29
S(6)	13	15	12
S(7)	23	30	37
S(8)	26	36	27
S(9)	17	25	23
S(10)	15	22	20
Self-Instruction Group			
S(11)	12	29	20
S(12)	14	30	24
S(13)	28	25	28
S(14)	35	32	31
S(15)	9	15	19
S(16)	16	22	38
S(17)	30	37	39
S(18)	15	22	22
S(19)	16	12	21
S(20)	16	37	40

Raw Data

Serve Test

(Scores are recorded as total of 2-4 point trials)

Subjects	Post-test	Retention-test
Traditional Group		
S(1)	4	7
S(2)	7	5
S(3)	4	4
S(4)	0	0
S(5)	2	3
S(6)	2	4
S(7)	5	4
S(8)	4	7
S(9)	2	3
S(10)	6	5
Self-Instruction Group		
S(11)	4	8
S(12)	4	7
S(13)	5	4
S(14)	8	8
S(15)	5	4
S(16)	2	6
S(17)	4	3
S(18)	3	6
S(19)	5	4
S(20)	4	5

Raw Data

Knowledge Test

(Scores are recorded as total out of a possible 28 marks)

Subjects	Odd	Even	Total
Traditional Group			
S(1)	11	11	22
S(2)	13	10	23
S(3)	12	10	22
S(4)	9	8	17
S(5)	14	11	25
S(6)	11	11	22
S(7)	14	13	27
S(8)	13	11	24
S(9)	10	12	22
S(10)	11	11	22
Self-Instruction Group			
S(11)	13	13	26
S(12)	12	13	25
S(13)	12	14	26
S(14)	14	12	26
S(15)	12	11	23
S(16)	12	11	23
S(17)	14	13	27
S(18)	11	9	20
S(19)	13	12	25
S(20)	10	10	20

Raw Data

Subjective Ratings

Post - test

Subjects	Judge #1				Judge #2				Judge #3			
Traditional Group	F	B	S	T	F	B	S	T	F	B	S	T
S(1)	3	2	3	8	4	3	2	9	3	2	3	8
S(2)	4	3	4	11	4	3	3	10	4	3	3	10
S(3)	3	3	3	9	3	3	3	9	3	3	3	9
S(4)	3	3	2	8	3	2	3	7	3	3	2	8
S(5)	3	3	3	9	4	4	3	11	3	3	3	9
S(6)	2	2	3	7	2	2	1	5	3	2	1	6
S(7)	3	3	3	9	3	3	2	8	3	3	3	9
S(8)	4	4	3	11	4	4	3	11	4	3	4	11
S(9)	2	2	2	6	3	3	2	8	3	3	2	8
S(10)	3	3	3	9	3	3	2	8	2	2	3	7
Self-Instruction Group	F	B	S	T	F	B	S	T	F	B	S	T
S(11)	3	2	3	8	2	2	3	7	3	2	3	8
S(12)	3	3	2	8	3	3	2	8	3	3	2	8
S(13)	3	2	3	8	3	3	2	8	3	3	3	9
S(14)	3	3	3	9	3	3	3	9	4	3	3	10
S(15)	2	2	3	7	1	1	2	4	1	2	3	6
S(16)	3	2	3	8	3	2	2	7	3	2	3	8
S(17)	4	4	4	12	4	4	4	12	4	3	4	11
S(18)	3	2	3	8	3	2	1	6	3	3	2	8
S(19)	2	2	3	7	2	2	3	7	3	3	3	9
S(20)	3	3	3	9	2	2	3	7	3	3	3	9

Raw Data

Subjective Ratings

Retention - test

Subjects	Judge #1				Judge #2				Judge #3			
Traditional Group	F	B	S	T	F	B	S	T	F	B	S	T
S(1)	3	3	3	9	3	2	4	9	2	2	4	8
S(2)	4	3	3	10	4	2	3	9	4	3	3	10
S(3)	3	3	3	9	3	3	3	9	3	3	3	9
S(4)	2	2	2	6	3	2	1	6	3	3	2	8
S(5)	3	3	3	9	3	2	4	9	4	3	4	11
S(6)	3	3	3	9	2	2	3	7	2	2	2	6
S(7)	3	3	3	9	4	4	3	11	4	4	3	11
S(8)	4	3	4	11	4	4	3	11	4	3	4	11
S(9)	3	3	3	9	4	4	3	10	4	3	4	11
S(10)	3	3	3	9	2	2	3	7	3	2	3	8
Self-Instruction Group	F	B	S	T	F	B	S	T	F	B	S	T
S(11)	3	2	4	9	3	2	4	9	3	2	3	8
S(12)	3	3	3	9	2	2	3	7	3	3	3	9
S(13)	3	3	3	9	3	2	2	7	3	2	3	8
S(14)	4	3	4	11	3	3	4	10	3	3	4	10
S(15)	3	2	3	8	2	2	2	6	2	2	2	6
S(16)	3	3	3	9	4	3	3	10	4	3	3	10
S(17)	4	3	4	11	4	4	5	13	4	4	4	12
S(18)	2	2	3	7	3	2	2	7	3	2	3	8
S(19)	3	3	3	9	3	3	4	10	4	3	3	10
S(20)	3	3	3	9	3	2	3	8	3	3	3	9

Appendix H

Table 8
Analysis of Variance - Wall Test

Group

Source	SS	DF	MS	F	Crit F(18)[1] (α= .05)	P
Group Effect	0.222	1	0.222	0.015	8.28	0.902
Within Group	258.372	18	14.354			
Total	258.598	19				

Time

Source	SS	DF	MS	F	Crit F(18)[1] (α= .05)	P
Time Effect	56.333	2	28.167	9.933	5.25	9.933**
Group by Time Effect	8.188	2	4.094	1.444	5.25	1.444
Time by Subjects Within	102.085	36	2.836			
Total	166.602	40				

* significant at .05 level

** significant at .01 level

Table 9
Analysis of Variance - Serve Test

Group

Source	SS	DF	MS	F	Crit F(18)[1] (α = .05)	P
Group Effect	2.756	1	2.756	2.106	8.28	0.164
Within Group	23.563	18	1.309			
Total	26.319	19				

Time

Source	SS	DF	MS	F	Crit F(18)[1] (α = .05)	P
Time Effect	1.806	1	1.806	3.753	8.28	0.0685
Group by Time Effect	0.156	1	0.156	0.325	8.28	0.5756
Time by Subjects Within	8.663	18	0.481			
Total	10.625	20				

* significant at .05 level

** significant at .01 level

Table 10
Analysis of Variance - Subjective rating Wall Test

Group

Source	SS	DF	MS	F	Crit F(18)[1] 1∝ = .05]	P
Group Effect	1.351	1	1.351	0.713	8.28	0.409
Within Group	34.105	18	1.895			
Total	35.455	19				

Time

Source	SS	DF	MS	F	Crit F(18)[1] 1∝ = .05]	P
Time Effect	0.546	1	0.546	1.469	8.28	0.241
Group by Time Effect	0.175	1	0.175	0.471	8.28	0.501
Time by Subjects Within	6.695	18	0.372			
Total	7.415	20				

* significant at .05 level

** significant at .01 level

Table 11
Analysis of Variance - Subjective Rating Serve Test

Group

Source	SS	DF	MS	F	Crit F(18)¹ (α = .05)	P
Group Effect	0.228	1	0.228	0.390	8.28	0.540
Within Group	10.514	18	0.584			
Total	10.742	19				

Time

Source	SS	DF	MS	F	Crit F(18)¹ (α = .05)	P
Time Effect	1.730	1	1.730	10.491	8.28	0.0017**
Group by Time Effect	0.003	1	0.003	0.024	8.28	0.879
Time by Subjects Within	2.309	18	0.128			
Total	4.042	20				

* significant at .05 level

** significant at .01 level